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The Government and Good Roads.

It is estimated that about fifty million dollars are spent annually in the maintenance of country roads in the United States. Whatever the sum may really be, there can be no question that most of it is entirely wasted, through ignorance rather than from any other cause. There are many sections of the country where only a few of the people know what a good road really is, or appreciate what such highways can do in the way of building up the prosperity of a district. In these sections road construction means nothing but a rude shaping of the earth surface and road repairs mean throwing the detritus in the ditches back on the center of the road. If a spasm of reform afflicts the community it may buy a scraper and crusher which, however, are rarely put under the direction of competent men. The results confidently expected from the purchase of this apparatus are not obtained, in consequence of the failure to use it properly, and the community becomes thoroughly convinced that all the agitation for good roads is a put-up job on the part of slick salesmen for road machinery houses. The root of the trouble is to be found in the lack of information concerning good roads. This is appreciated in many parts of the country, and the Department of Agriculture is petitioned more and more frequently to furnish suggestions concerning the proper means for carrying out improvements of this nature.

There is a very strong and widespread feeling that the federal government should not engage in enterprises that will in any way replace work that would normally come to private parties. This view is one with which The Engineering Record is in accord, but it does not believe that the road work of the Department of Agriculture in any way touches upon this forbidden ground. In fact, the men in charge of that work have used great tact in preventing anything of the sort, and have refused to countenance anything that would help individual business interests, although great pressure has sometimes been brought to bear on them to do so. This work is really educational, preparing the way for the time when American roads will be administered in an economical manner, like those of Great Britain, France, Germany and Switzerland. The amount of money now wasted in construction and maintenance is such an enormous loss to the country that federal educational work is warranted. It will eventually be supplemented by State work and then by county and town work, as the importance of the subject becomes more generally recognized. This government advice is not technical, except in a secondary sense, but is educational, and this distinction is a most important one to bear in mind.

Another fact may be mentioned in this connection. For a good many years the so-called road work of the Department of Agriculture was a farce. Slushy bulletins were issued, replete with misleading statements and statistics that few people believed at all. Sample roads were built in a few places and lectures were given by employes of the bureau; some of this work was doubtless well done, but it was overshadowed by the blight cast by a strange association that traveled about the country giving "demonstrations" under financial conditions that often aroused protest. While the bureau at Washington was issuing bulletins of the glorious results of these personally conducted enterprises, the victims were uttering very different opinions. All this has now been completely changed. The old bureau has been greatly enlarged and turned into an office, with Mr. L. W. Page as director, a fact that in itself is a guaranty of the high grade of the work that will be done. His staff is made up of picked men, the important positions being filled by technically educated and practically trained specialists. So far as the appropriations for the office permit, advice will be furnished to all applicants for information of the class the organization is intended to fill. The quality of road-making materials will be investigated, and suggestions concerning the organization of road work will be furnished. One of the best steps lately taken is the establishment of a training school in which young men of sufficient education will be taught the details of road construction. If the program is carried out, a few years will witness the widespread dissemination from Washington of reliable information concerning road improvements and the training of really competent specialists, who can be engaged to take charge of road improvements in districts which have found sufficient enlightenment to appreciate the need of such assistance. The whole work of the Office of Public Roads is now conducted on such a different basis from that followed until recently that far reaching results for the good of our rural districts may be confidently expected to follow shortly.

Civil Engineers and Patents.

The decision of the United States Circuit Court of Appeals in the Glover sewage disposal patent suit against the City of Pawtucket, reviewed on page 319 of this issue, brings to mind the discussion that took place a few years ago at a meeting of the American Society of Civil Engineers, on the subject of patents. Formerly a considerable number of civil engineers considered it extremely unprofessional to take out patents on improvements they designed, following the lead of physicians in this respect, who looked upon "patent medicines" as quack nostrums. This opinion is still held by some practitioners of both engineering and medicine. It is important to remember, however, that most physicians employ proprietary remedies or patented supplies to-day, knowing that their quality is the best possible. The reason that the quality is so high is because the protection of the patent law enables the makers to invest the money and time in these supplies which are needed to produce the high-grade products desired. Without this protection such quality could not be obtained except at very much greater cost to the purchaser, for unpatented supplies always tend to become cheap and inferior in quality and high-grade products become expensive specialties rather than standard articles.

There is another aspect of this patent matter, however, which concerns more specially civil engineering work. It sometimes happens that an engineer designs for a client some device which can be employed often enough in other works to warrant a manufacturer making it as a regular product. In case there are any details of this apparatus which require careful workmanship or good materials in order to make the device successful, it is, in a sense, the engineer's duty to patent the appliance and intrust its manufacture to parties who will construct it properly. If he does not do this the chances are that the apparatus will be built imperfectly and it will not be of the general value that its merits justify. The public actually loses through the refusal of the engineer to protect his invention by patent from assault and battery at the hands of ignorant or unscrupulous parties who put it on the market without proper workmanship and materials. The engineer's reputation is also likely to be affected by such poor reproductions of his plans.

It occasionally happens, moreover, that engineers discover certain methods of attaining desirable ends by the use of new structures. For example, Mr. Cameron, of Exeter, spent some years in careful investigation of the septic tank and its manipulation to secure certain changes in sewage. His work has been of great importance. He took out a number of patents and, so far as this journal is aware, no septic system built and operated in accordance with his advice and patents has been unsuccessful. As a result of his success a lot of processes which are not his have been called septic tank processes, and discredit has been cast on his work in consequence. This journal believes that the septic system would be in far better condition to-day could the Cameron patents have been made sufficiently strong to control it absolutely. Such control would have prevented the waste of money in foolish cesspools and other monstrosities called septic tanks. The situation would have been the same as that existing to-day in the matter of bascule bridges, a type of structure which owes to the protection of the Scherzer patents its development to fill a marked need in bridge work. These patents warranted the investment of time and money in bascule bridge missionary work which was needed to introduce the type. In the same way the patent office protection given to the Babcock & Wilcox Co. years ago made the water-tube boiler what it is to-day, in a very large degree. Without that protection nobody would have spent the money in experiment, manufacturing plant and selling agencies which was put out by that company and is now being harvested by many other companies as well as themselves.

The Glover patents, however, offer a different field to contemplate. After reading the decisions two Federal courts have passed upon them and studying the history of the septic tank system prepared by Mr. Metcalf for the American Society of Civil Engineers a couple of years ago, it is difficult to understand what possible reason there can be for putting such patents as these forward as covering anything of a septic tank character. The patentee was plainly ignorant of the real nature of the changes that take place in sewage when it stands in tanks, and any engineer who built a system in accordance with the original Glover idea, after the experience already had with it, would be crazy. If these patents had been interpreted by the courts to cover the septic tank treatment of sewage, however, a method of treatment which was manifestly unknown to the patentee, there would have been a most unfortunate miscarriage of justice. This would give control, or partial control, of an important "art" to the owners of a patent taken out by a man who never contemplated any such thing. It would take from Cameron the credit and rewards that he deserves as the first inventor to make the septic tank a working success and a regular feature of engineering practice, and give them to others with no title to such honors and returns except a forced interpretation of the claims of patents for something else.

The Falling of Buildings.

Separated by intervals of no great length, so-called "accidental" collapses of buildings have become quite a standard feature of building experiences in the cities of this country. Sometimes it is the failure of a new building in process of construction, at other times it is an old building undergoing repairs or reconstruction, and occasionally an old building about to give place to a new one collapses, with a serious loss of life, while being demolished, but the "accidental" feature is the same in all. The parties interested consider the casualty a happening beyond reasonable foresight or an event which could not be anticipated. It is possible that in most cases the parties in responsible charge have not a sufficient knowledge of the conditions attending their work to enable them to previse the inevitable results, but that is simply stating that they are not qualified to discharge the responsibilities which they undertake. As a matter of fact, that is about what one of these building "accidents" usually means.

In the city of Albany there is no department of the city government charged with the supervision of building work, although the chief of the Fire Department has an official relation to such operations. Consequently, if any owner desires to repair an old building, or remodel it, or supplement old construction with new to any extent whatever, he is substantially free to secure the services of any builder, incompetent or otherwise, with sufficient assurance to undertake the job, provided he can read the architect's plans. The remodeling and partial reconstruction of an old building, indifferently constructed and originally designed for radically different purposes from those to which it has been devoted during the past twenty-five years, is, in general, an undertaking requiring careful study of all the features of the structure and a deliberate survey of all the conditions, many of them obscure, bearing upon the desired results. In the case of the department store structure that failed in Albany recently, the old building was composed of two or more light dwelling houses adapted to the purposes of a large department store, on the various floors of which were carried many tons of merchandise in charge of a large clerical force catering to a far greater number of customers during m [illegible] of the day. A more dangerous responsibility than that created by the operation of reconstruction without interfering with the business of the store can scarcely be imagined. In other words, the safety of scores of lives and a large amount of valuable property was entirely dependent upon the care with which the plans for the work were considered, and the still more scrupulous care taken in its execution.

Notwithstanding these dangerous features of the proposed work, there has not yet been brought out any substantial evidence that the rather light character of the original buildings and the decidedly ramshackly character of their adaptation to commercial purposes had any influence whatever upon either the plans of procedure of the contractor or upon the degree of care exercised in his operations. Perhaps it is too much to expect an owner to exercise any judgment as to technical matters under such circumstances, although a little common sense was the only thing needed in this case to prevent the "accident." It was the plain duty, however, of somebody to exercise good judgment in such an affair, in which, in reality, the highest grade of technical ability is required. Apparently the owner depended upon the contractor for such structural judgment and experience as he himself did not possess, unless, indeed, he relied upon the architect for technical advice. The architect, indeed, is the agent on whom the owner should confidently rely in such a case. It is probable, however, that there are few cases in which the architect takes sufficient interest in mere matters of construction to insure his client against the danger of a contractor doing precisely the fatal thing done in this instance.

It may be a matter of some difficulty to define the exact source or center of responsibility for this building collapse, which was described in detail in this paper on Sept. 2, although no effort should be spared to find the party responsible and hold him strictly liable for the full consequences of his incompetency or worse; but the cause of the collapse is so clear as to admit of no doubt whatever. It requires no lengthened experience or unusual skill in the business of underpinning old buildings to realize that the proper order of procedure is first to secure the old structure and then proceed with the excavation, thus insuring the safety of the structure at the first step in the proceeding. In this case, however, the safety of the old structure with its contents of people and property, appears to have been a matter of little concern. The desired excavation was made practically to its full depth without taking the first measure to insure safety. The lowest tier of cast-iron columns, supporting the entire building above them, with all its contents, were allowed during and after excavation to rest upon blocks of the natural damp clay underneath their bases. In other words, the condition was practically that resulting from completing the entire excavation with the exception of the earth masses, about five feet high, immediately under the cast-iron columns, with the expectation that those small piles of earth would sustain the loads carried by the columns. There could be no clearer case of ignorance or incompetence. It is full time to call these things by their right names. The merest tyro in engineering would not have permitted any excavation, except that required for the support of the underpinning sticks, prior to securing the complete safety of the building.

These building collapses are the plain and inevitable results of the ignorance and incompetence of those in responsible charge of the work, whether architect or contractor. There is no sufficient reason for their being, and they will cease when all such work is performed under competent engineering direction.

The Business Side of Municipal Engineering.

There are few commercial houses to-day in which the system of accounting does not afford the managers immediate knowledge of the expense of each item of each class of work carried on. In no other way is it possible to determine where money is being wasted or skimped, or to estimate the expense of new classes of work. Accurate accounts alone furnish the information by which the real success of a venture can be determined, and this is as true of engineering as anything else. Any ordinary structure or machine can be designed by most technical students well enough to answer its purpose, but it is a far different matter to design it so that its final cost will be the lowest consistent with its object. Where much design and construction are carried on, careful accounting is absolutely necessary to ensure strict economy, for otherwise the heads of departments can have no check on the work of their numerous subordinates.

All this is a truism among business men, but in public engineering offices the importance of the subject does not receive the same attention. One reason for this is the pressure brought to bear to force unnecessary employes into the minor places in such departments, thereby raising the salary charges, and another is the lack of any commercial incentive to keep down the expenses. Still another cause of defective accounting is the practice in most American cities of turning the execution of public works over to other departments than that of the city engineer, thus giving him no control over the expenditures for the structures he plans. Where, however, the city engineer builds as well as plans he has an excellent opportunity to practice all those economical methods that have proved so useful in commercial affairs.

As an illustration of what can be done, reference may be made to some of the methods in the office of Mr. E. J. Elford, city engineer of Southend, England. Here the construction is done under the supervision of the city engineer, partly by day labor and partly by contract. Some of the materials used by contractors are bought by the city, so as to ensure an opportunity of carefully inspecting them before use. All sewer pipe is bought by the city direct from the makers and issued to the contractors or the city's men as needed. Under this system it is possible to make a more effective inspection than is practicable when the pipe is supplied by a contractor and sent directly from the cars to the work. The cost of trucking to the city yards is more than covered by the saving which results from dealing directly with the maker. The minor supplies are also bought in large quantities, in order to afford opportunity for inspection as well as to save cost. Shovels, picks, small castings and the like are often of poor quality and high price if the dealer knows they are urgently needed and will not be examined critically. Even in painting, the contractor is required to deliver all his white lead on the work at one time, so that samples may be properly selected and analyzed.

This procedure is adopted wherever practicable, even for some contracts where its use seems decidedly strange to an American engineer. For instance, team labor done by contract is subject to a stipulation that all teams must be inspected each morning and the contractor must forfeit 2s. 6d. for each horse rejected. This provision in the contract is the result of unsatisfactory attempts to secure only good outfits by inspection alone. It was found that horses rejected on first inspection would be sent around again half an hour later and were usually put to work then. The plans for the day had been confused by the first rejection of these horses, and in order to avoid further delay, the inspection when they were driven up a second time was perfunctory. By fining the contractors for each unserviceable horse presented, only good teams are offered and the amount of work done is increased correspondingly.

Complaints about the burden of the taxes are heard in Southend as well as in American cities, and Mr. Elford has accordingly taken special steps to prevent any needless maintenance and operating charges in the works under his direction. He has found the most effective way of doing this is by using expenditure charts. For example, on the chart relating to the removal of house refuse are plotted curves representing the population, which fluctuates in such a summer resort, the variation in the total cost of the work month by month, the relative cost of manual and team labor, the number of men and horses engaged, and the average cost of the work as estimated at the beginning of the year, when the appropriation for it was made. A glance at such a chart enables the engineer to detect at once any variation of the actual cost from the estimate and to investigate it before any serious condition has arisen.

These are merely a few of the methods adopted in this office to ensure its businesslike administration. There are many others, such as a check on each draftsman's work and the use of a camera to keep progress records on construction, which are not unusual, but are rarely found collectively employed in a city office. It is unnecessary to describe them here, as enough has been said to show that careful accounting and close financial supervision of municipal engineering are not only practicable but are actually in force. The point The Engineering Record wishes to make is that it is a good system in small places; Southend is a city of only about fifteen thousand population. This care for the pennies is practiced in American cities when the water or electric works are owned by private parties and there is no reason why it should not be shown by all public officials.

Notes and Comments.

Baltimore Sewerage Affairs took on the semblance of real work through the action of the Sewerage Commission on Sept. 7. At a meeting of the Commission and its consulting engineers, Messrs. Rudolph Hering, F. P. Stearns and Samuel M. Gray, the members of the Commission very clearly stated that they would have to depend on their technical advisers for counsel concerning the engineering problems to be solved. As a first step the Commission passed the following resolution: "Resolved, That the effluent proposed to be discharged into the bay and the system recommended by the engineers shall be of the highest degree of practical purity." Although the wording of this resolution is not wholly in keeping with good English usage it will doubtless be sufficient for the guidance of the engineers. The degree of purification called for is doubtless explained by the Commission's desire to prevent any injury to the very important oyster industry in the vicinity of Baltimore.

Dredging Contractors have so long complained about the loss of time and money due to the rapid wear and breaking of dredge teeth and cutting edges, that attention may well be called to the peculiar fitness of manganese steel for such parts. This metal resists abrasion and impact in an unusual way, and has long been employed for special track work like frogs and crossings. Some years ago, it was introduced for the pins of ladder dredges, but the utility of the metal for shovel and bucket dredges has only recently been brought to light. Perhaps one reason for this is the trouble most smiths have in working manganese steel, which arouses an opposition to it among the employes of a dredging contractor. To remedy this trouble the Taylor Iron & Steel Co., which controls the American patents on manganese steel, has taken up the manufacture of these parts itself, and the only objection to their use has thus been removed. They have been designed so as to be readily put in place.

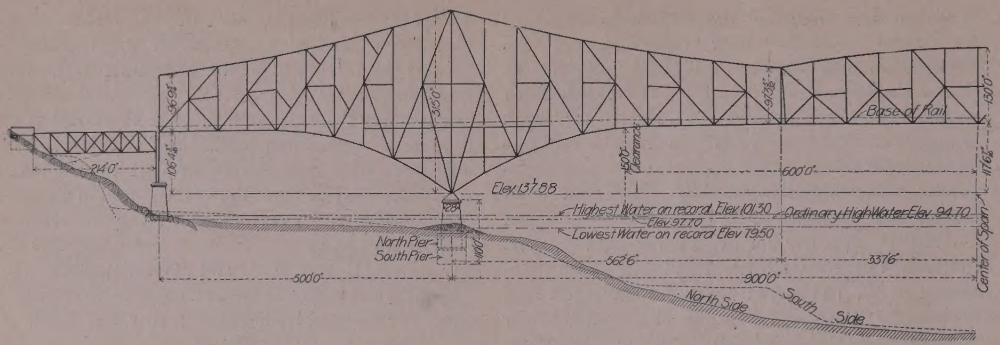
An Interstate Water Suit of a novel character has just been decided by Vice Chancellor Bergen, of New Jersey. Some time ago the Hudson Water Co. made a contract to deliver water from the Passaic watershed in New Jersey to Staten Island, in New York. This contract was attacked as unconstitutional and this view has been sustained by the courts. "The constant increase in our population, considered in connection with the unchanging extent of the watershed and the consequent limit of the natural supply of water," Chancellor Bergen said, "may justly alarm the State with regard to the future, and a neglect to insist upon its rights in the past, when conditions did not require a strict enforcement of its privileges, works no estoppel and justifies the restriction of the appropriation of its property." As the owner of the tidal bed of all streams, the State is held to be the owner of all fresh water naturally reaching such tidal beds, and has the right to prevent any impairment of this flow. While it may justly raise no objection to the diversion of the water for the use of its own people, it can prevent such diversion for the benefit of people of another State.

The Complication of Gauges on street railways is again brought to notice by the change being made by the East St. Louis & Suburban Ry. to the standard of 4 ft. 8½ in. The street railways are in the same predicament that the steam lines found themselves in years ago. The construction of interurban lines makes it desirable to have a uniform gauge so that through cars can be run, and much extensive reconstruction will be necessary before this is possible in many parts of the country. In Baltimore, Philadelphia, Cincinnati and St. Louis the gauge is wider than standard, and this is generally true in Eastern Pennsylvania, Western New Jersey, Delaware and Maryland. It is this difference of gauge which prevents through service between Philadelphia and New York, and between Baltimore and Washington. In the Pacific States 3½ ft. was a favorite for a time. In Los Angeles a third rail has been laid along the older track so that the standard-gauge interurban cars can come into the city. At Tacoma 3½ ft. has been abandoned, but it is still used in Portland. In Denver, where it is also used, the interurban lines have adopted it in order that their cars may run over the city tracks.

The Russian Discrimination against the United States in the way of an extra duty against certain of manufactures, mainly machinery, iron and steel products, refined petroleum and some food materials, has been withdrawn. This announcement was made in the following note to President Roosevelt from M. Witte: "Some years ago, in consequence of a misunderstanding in the interpretation of the most-favored-nation clause, there were established in Russia on several articles of American production custom duties on a higher scale than those levied on the same articles when imported from other countries. His Majesty the Emperor of Russia has commanded me to inform the President of the United States that he has been pleased to order the discontinuance of the levying of such higher duties on American products, in order that henceforth the American manufacturers should pay the same duties as importers from other countries." This will be welcome news to many readers of this journal, who have suffered by the discrimination against their products. The history of the matter has been a decidedly interesting one to students of our national economics, and its satisfactory outcome is a personal tribute to President Roosevelt's work for an honorable peace in the Far East.

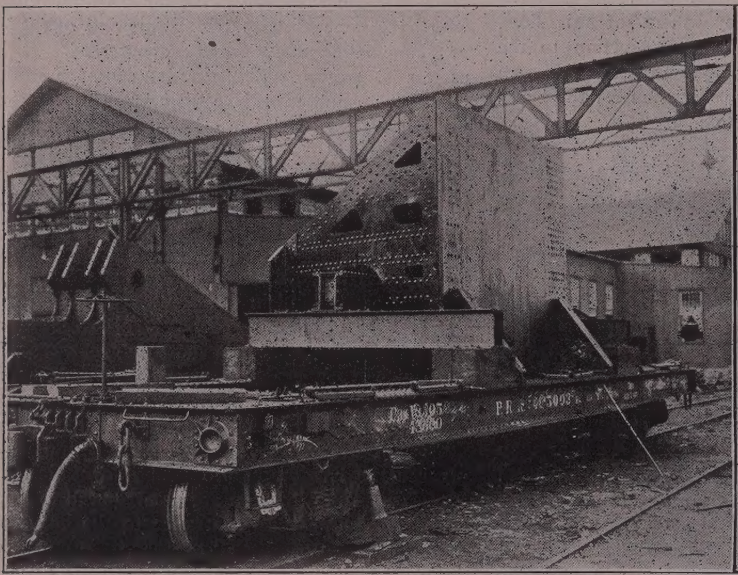
The Number of Technical Graduates turned loose from engineering colleges each year has attracted considerable comment from engineers, but it has been reserved for Prof. Samuel B. Christy to propose a drastic reduction in this number. He states that 300 graduates per annum will satisfy the needs of the mining industry, and that the production of more is a waste. He also believes that there are too many mining schools, although he would probably object to the suppression of that of the University of California. The Engineering Record does not hold this opinion in any degree. It is glad to see increased facilities for engineering instruction and a great number of young men taking advantage of them. The greater the number of these men the better will be the average work in engineering and the higher the estimation in which the great engineering positions are held. A large proportion of the students in technical colleges are wasting their time, just like those taking art courses, and we all know that there are lots of people studying music who have none of it in their souls and ought to be immediately and severely suppressed. It is useless to expect engineering students to differ from others and to relieve them from the law of the survival of the fittest by any restriction of their number.

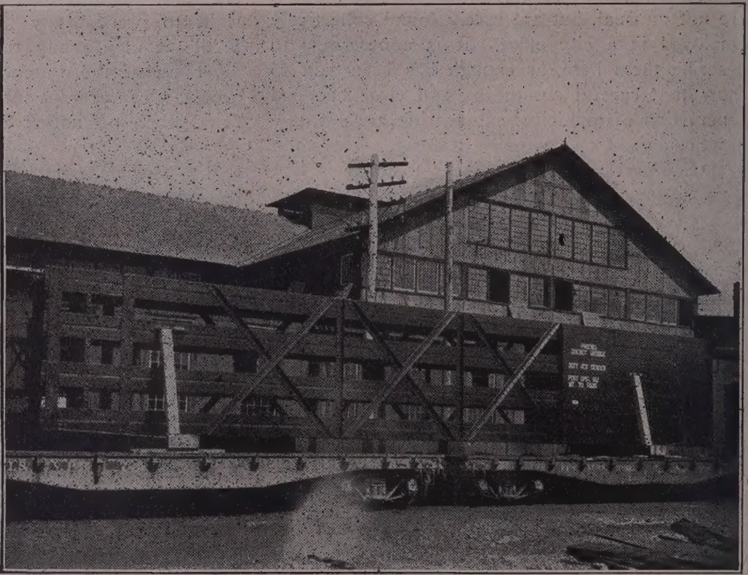
An Elevated Railway Accident in New York on Sept. 11, in which a car dropped to the street below, killing and injuring many passengers, and another car narrowly escaped the same fate, was the first of its kind in the many years of operation of the Manhattan Ry. It occurred at a branching point where a sharp curve turns off from a long tangent. There is no superelevation on the curve, as the tangent does not permit it; consequently all trains bound around the curve are required to stop before entering it and then proceed slowly. Trains proceeding down the tangent beyond the junction are not required to stop or check their speed. Entrance to the curve is controlled from a switch tower, and the operator throws the switches in accordance with the signals on the head of the first car indicating the destination of the train. The wrecked train was running on the tangent route, but was switched to the curve, where its speed was apparently great enough to throw the second and third cars from the rails. The coupling between the first and second car broke and the first car, a heavy motor car, remained on the rails. At this writing responsibility for the switching of the train to the wrong track has not been determined. As is always the case after such accidents, various assertions concerning the practicability of improvements at this point have been put forward by inexperienced critics. All of them are intended to afford some means of superelevating the outer rail on the curve, and introduce serious structural and operating difficulties. Whether any of them is practicable can only be determined by careful study, but until improvements are made it might be well to stop all trains approaching this junction point, so that none of them, either intentionally or accidentally, will enter the curve at high speed.



PROGRESS ON THE QUEBEC BRIDGE.

The construction of the Quebec bridge has progressed so far that over 25,000,000 lb. of the superstructure have been finished in the bridge shops, half as much has been shipped to the site, and its erection on the completed substructure has been commenced, thus demonstrating the practicability of the manufacture and shipment of larger structural members than had ever before been completed in the shops, and the successful handling of them by an unusual field plant. A general description of the design of the bridge and the methods and plant for manufacture and erection was published in The Engineering Record of March 4, April 1 and 8 of this year, and those articles will now be supplemented by some recent photographs of the large members and by data of the progress.


Shoe Loaded for Shipment on Special Car.


Lower Section of Main Post.

The bridge crosses the St. Lawrence River with a clearance of 150 ft. above highest tide for a length of 1,200 ft., and its center span of 1,800 ft. is made necessary by the difficulty and expense of constructing main piers on each side of the channel, which is unobstructed. The total length of the bridge is 2,800 ft., exclusive of two 210-ft. approach spans, and it will be the only bridge across the river in a distance of nearly 1,000 miles between Montreal and the Gulf of St. Lawrence. It is located on the new Grand Trunk Pacific Line and will provide connections between the Great Northern Ry. of Canada, the Quebec & Lake St. John Ry., and the Canadian Pacific Ry. on the north side of the river and the Grand Trunk Ry., the Intercolonial Ry. and the Quebec Central Ry. on the south side. At this point the river is about 2,000 ft. wide, 200 ft. in maximum depth, and has a 15-ft. tide and a 3-mile current. It flows over a hard-pan bottom covered with large boulders and carries, every year, great fields of thick ice. In the winter the temperature falls 40° or more below zero, the winds are high and the days very short, so that work out of doors must be suspended for several months.

Notwithstanding these difficulties and the unusual magnitude of the work, the Phoenix Bridge Co. contracted to complete it between April, 1904, and December 31, 1908, a very short period for making the designs, rolling all material, installing special plant and doing the shop work, testing, shipping and erection of 80,000,000 lb. of high-grade steel work of dimensions which in some cases are governed by the limiting capacities of the largest mills and tools in this country, and have required for its shipment and handling a special plant larger than had before been made. Work has been vigorously and successfully prosecuted; the sub-structure, comprising two large, deep pneumatic caisson foundation piers and two open coffer-dam piers, has been completed at a cost of over $1,000,000; two spans of the superstructure have been finished in the shops, one span has been shipped to the site, where an elaborate power plant and special field machinery have been installed for storing and handling the truss members, and erection has been commenced. The progress in the shops and field is considered satisfactory by the contractors and indicates the completion of the work within the required time.

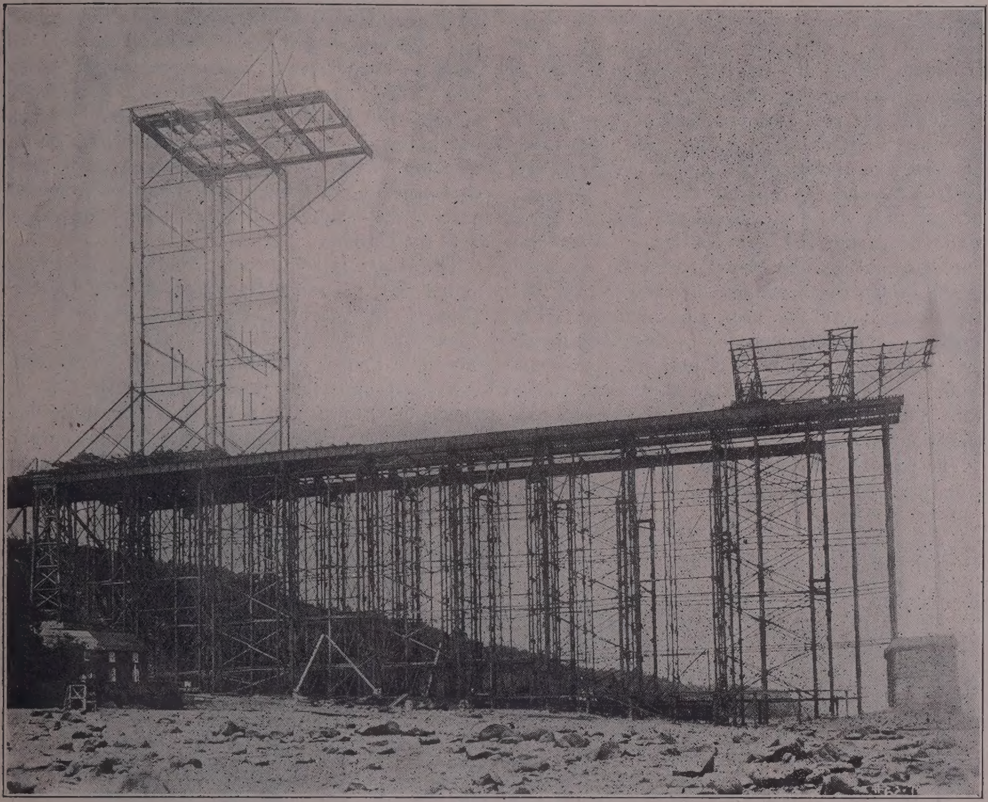
The main trusses are continuous from anchorage to anchorage, 2,800 ft., and have upward reactions at two points only, at the main piers, 1,800 ft. apart on centers, where they have fixed supports. Expansion is provided for at the anchorages and at the ends of the center connecting span. The trusses are in vertical planes 67 ft. apart, and vary in depth from 98 to 315 ft. Both chords are parabolic curves and are divided into panels 50 ft. long, except in the center span, where they are 56¼ ft. Each truss is symmetrical about the center line and comprises two 500-ft. anchor arms, two 562½-ft. cantilever arms and one 675-ft. center span, the latter being longer than any simple span yet built. The trusses are pin-connected throughout, but the field connections of the lateral and sway-brace systems and the floor system are riveted by pneumatic hammers.

The bridge is designed to carry two railroad tracks, two electric street car tracks, two highways and two sidewalks. A wind pressure of 25 lb. per square ft. is assumed and, together with the dead and live loads, produces maximum stresses of 15,000,000 and 16,000,000 lb. in each top and bottom chord, which have corresponding cross-sectional areas of 675 and 842 square in. All of the truss members are finished complete, ready for erection, at the shops, and the pieces thus required to be shipped and assembled are of unprecedented magniture. Most of the eyebars are 15 and 16 in. wide with 12-in. pins. The floor beams are massive plate girders 10 ft. deep and about 66 ft. long, and weigh 60,000 lb. each, equal to good-sized girder bridges. The very long diagonals of the main trusses are made in two lengths, with separate pin connections to the intersecting vertical posts.

Some of the longest and heaviest members weigh as much as 105 tons and require single special steel cars or three ordinary cars for their shipment from the bridge shop to the site, a journey which requires at least 10 days. Materials are received at both ends of the bridge and unloaded and stored in each yard by two 60-ton electric traveling cranes of 60 ft. span with 750-ft. runways. Locomotives and steel flat cars on standard gauge tracks deliver the steel from the yards to the erection traveler.

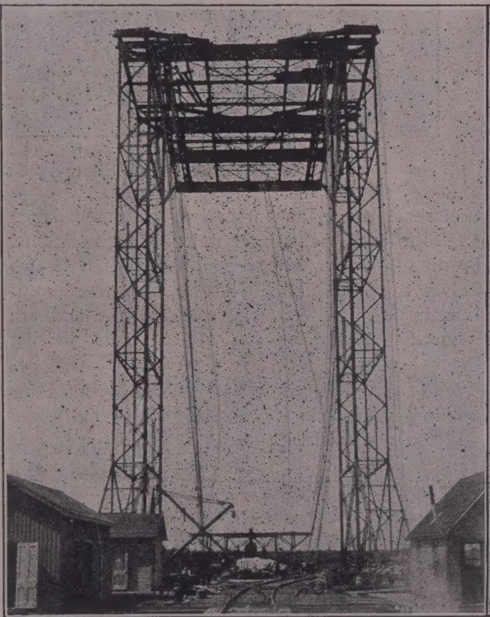
The anchor arms will be erected on steel falsework weighing about 1,200 tons; it consists of two independent lines of 9x9-ft. towers, one line for each truss, each tower having four vertical posts from 130 to 160 ft. high, seated on grillage foundations. The towers support the trusses directly at panel points and their outside posts are carried from 10 to 80 ft. higher to receive the plate girders forming the traveler track. All field connections are bolted so that the falsework which is now in service on the south side of the river can be transferred to the opposite side for the erection of the north anchor arm span. Two standard gauge tracks, between the traveler tracks, are carried to the main piers on wooden falsework, independent of the steel falsework, and are used entirely for the delivery of materials to the traveler.

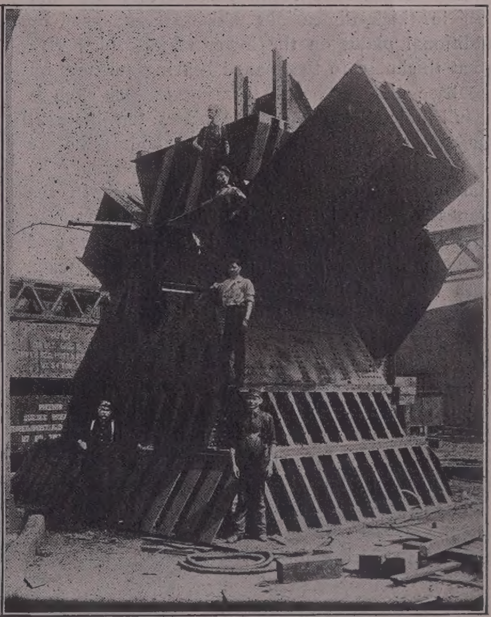
All of the superstructure will be assembled by the 450-ton steel traveler now in service on the south anchor arm falsework. For the cantilever erection of the structure between the main piers, the traveler will be supported on temporary box girders carried by the pins at main panel points. The traveler, which was fully described in The Engineering Record of March 4, is of dimensions unapproached in previous work and consists of a rectangular 103x54-ft. vertical tower 215 ft. high, with a base extended so as to be 174 ft. long and a forward overhang of 66 ft. It is supported by 24 wheels, running on six rails, and has an inside clearance 79 ft. wide and 202 ft. high, enabling is to pass back and forth over any part of the completed structure, thus allowing the latter to be at all times thoroughly braced and connected.


Falsework Erecting Traveler and Steel Traveler for Erecting Bridge.

Immediately after the completion of the railroad approach last July, the traveler was rigged with eight 55-ton, eight 25-ton and twelve 10-ton tackles operated by four special electric hoisting engines, each having two drums and four capstan heads. The engines were made by the Lidgerwood Manufacturing Co., and their 115-h.p. motors were furnished by the General Electric Co. All their operations are commanded from one point and they are provided with variable speed gearing so that light loads can be handled rapidly. The superintendent reports that the heaviest (105-ton) pieces are handled as easily and surely as ordinary members. No steam, horse or hand power is used for erection, all plants being operated by electricity from the Chaudiere Falls power plant, which runs locomotives, air compressors, hoisting engines, crane service, light and all other plant.

The erection of the anchor arm span on the south side of the river was commenced July 22 and the main anchorage bent (described on April 1), the bottom chords, the lower lateral system and the main shoes and pedestals have all been assembled and service-bolted since that date. It is expected by the contractors that the anchor arm span and the first two panels of the cantilever span will be erected before the field work is suspended, which will probably be from about November 15 to April 15. The members have been handled by the steel traveler moving back and forth and setting the 68-ft. lower chord pieces on 450-ton special hydraulic jacks seated on I-beam grillages on top of the falsework towers to provide for camber adjustment. The chord splices and the lateral connection plates have been bolted, but the rivets will not be driven until the bridge trusses are completely erected and swung and receive their final dead load.


Steel Traveler 212 Feet High.


Bearing of Main Post.

The bearing on the top of the main pier is the key of the erection and its members were recently assembled in the bridge shops and taken apart, shipped to the site and are now reassembled, presenting the same appearance as is shown in the accompanying illustration from a photograph at the shop. The preliminary assembling of these members is an exceptional precaution which will not be repeated for the other members of the bridge, as the correctness of the drawings, careful allowance of clearances, accuracy of shop work and close inspection insure easy assembling the first time. The dimensions and weight (565,000 lb.) of the pieces assembled for this connection are greater than those of any bearing ever before assembled and the excellence of the design and its execution are well shown in the illustration.

At the foot of each main vertical post, five principal truss members and four secondary members converge, concentrating the maximum stresses in the bridge and transmitting them through the bearing to the pier masonry. All of the members are connected to the main shoe, which provides a hinge connection for the truss and is seated on a distributing pedestal designed to diminish the intensity of the 28,000,000-lb. load to a unit pressure of about 78,000 lb. per square foot on the granite cap stone.

The five principal members here are two bottom-chord sections, two diagonal posts and the main vertical post, all of which are connected to the shoe by a 24-in. pin, 6 ft. 9¾ in. long, with a 6-in. hole through its axis. The braces are the bottom transverse strut, two lower lateral diagonals, and a sway brace diagonal, all of which have field-riveted connections.

The main pier bent, 315 ft. high, center to center of pins, has two vertical posts 67 ft. apart on centers, which are divided by transverse trusses, girders and struts into five panels. The center panel is unobstructed by diagonals so as to afford clearance for the traffic, which is carried on a single deck about 129 ft. above the top of the masonry. Each post is made in five sections, corresponding to the panels, with lengths of about 45 to 77 ft. The upper section has a special cap riveted to it to receive the pin-connected tension members. The lower section is 59 ft. 9½ in. long, 10 ft. wide and 4 ft. thick, weighs about 60 tons, and has a cross-section principally composed of sixteen 8x8x13/16-in. angles, four 48x13/16-in. and four 48x¾-in. web plates. It is built with four plate-girder-like webs, with their flanges connected by wide tie plates and X-bracing of 6x3½-in. lattice bars, both of which, in the same panel, are continuous, the outstanding leg of one being cut to clear the other. The post sections are spliced with planed butt joints and cover plates having a great number of field rivets.

The lower end of the bottom section is reinforced by flange cover plates and by vertical diaphragms, parallel to them to form a bearing on the horizontal top plate of the shoe, shown in the upper part of the illustration. This shoe weighs 57,000 lb. and was made separate from the post section so as to facilitate the machine shop work and reduce the shipping and erecting weights, and will be made integral with it by field rivets through the horizontal flanges of both members.

The shoe has a 10x5½-ft. planed horizontal top plate 1¼ in. thick, and is 9 ft. high. It has four longitudinal vertical webs with half-hole pin bearings on the lower edges. They are made of several plates riveted together, the outside plates extending beyond the others to have full pin holes and lock the piece to the pedestal. The webs are connected by four vertical and transverse diaphragms with heavy flange angles serving as reinforcements. The webs are 3 in. thick and are spaced to clear the five webs of the pedestal and the four webs of the lower chord, which all engage the same pin. The lower ends of the diagonal members have their center lines intersecting on the pin center, but have separate connections to the foot of the vertical post.

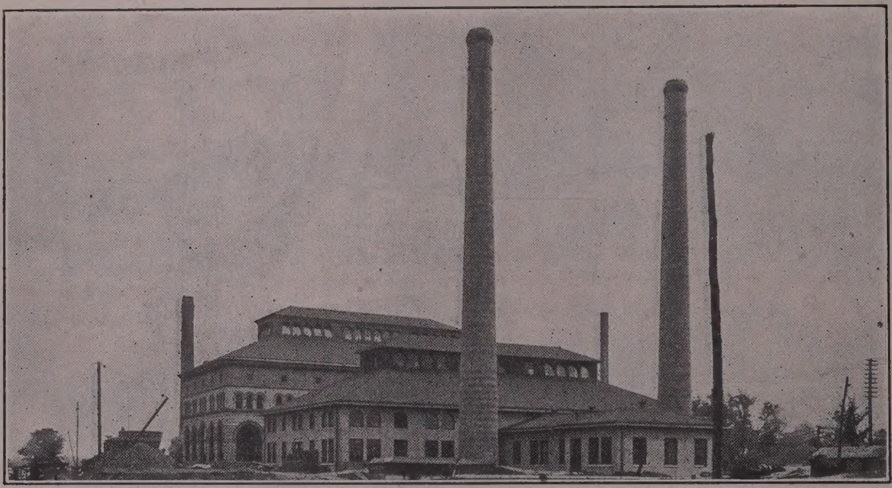
The end sections of the lower chord in the anchor arm and cantilever trusses are about 5½ ft. wide and 4½ ft. deep, and of similar construction to the main post, except that the four webs are built channels instead of I-shaped girders. They are united over the pier by a special V-shaped piece weighing 102,000 lb., which is web-spliced to them and has two 14-ft. branches. Its webs are built up with 8x6x15/16-in., 42-lb. angles, and ¾-in. and 15/16-in. plates, to a maximum thickness of 7 in. at the pin bearings.

The 156,000-lb. pedestal is 13 ft. long, parallel to the bridge axis, 11 ft. wide and about 8 ft. high. It has five longitudinal webs connected by five transverse diaphragms and two cover plates. The webs are built of 1-in. and 1⅛-in. plates riveted together to make pin bearings 6⅛ and 10¾ in. thick, dimensions which are increased by additional plates on the lower edges which give great thickness to the planed bearing surfaces on the base plate. The pin bearing in each web is a full hole, but the outside plates terminate at the center line of the pin. The outside webs are thinner than the inner ones and are stiffened by massive outside gussets or knee braces in the planes of the interior transverse diaphragms. The 3-in. base plate is planed on both sides and is made of two equal pieces, each 69 in. wide, with a planed butt joint on the center line of the truss. Heavy bent plates reinforced by vertical bearing angles, are riveted to the outer sides of the exterior webs and of the shoe and pedestal in the planes of the lower chord flanges, engaging them and the bottom lateral connection jaw plates, all the members being solidly field-riveted together to make a massive integral connection for the lateral system.

The construction of the pedestal, although simple, involves a large number of pieces, and the shop drawings comprise thirteen plans and sections besides many smaller ones, which, at a 1-in. scale, cover a 39x120-in. blue print sheet and make a very handsome appearance. Its design required seven months' work by an expert draughtsman. Both its weight and dimensions were too great for transportation on a standard heavy car, so the Pennsylvania Railroad Co. built a special steel car for it. This carries the shoe suspended between the trucks, with the upper and lower edges 13 ft. and 6 in. respectively, above the rails. A heavy box girder was passed through the pin hole in the pedestal and supported on two pairs of transverse I-beams with their ends set on longitudinal beams which distributed the weight of the shoe on the car. To hold the pedestal in place and prevent oscillation on the box girder, heavy steel plate brackets were bolted to the approximately vertical base plate and set to bear on the car floor.

Great pains were taken to design the details of this bearing so as to make it entirely from standard materials and provide satisfactorily for its manufacture, finish and shipment, and the final details and dimensions were adopted only after careful investigation of the conditions and conferences with the railroad representatives as to shipment of pieces. The erection plant was designed to handle the heaviest pieces and some of them required the largest maximum dimensions of materials that could be procured or received by the machine tools. The bolster was made with an upper and a lower part, each built in halves and secured together by long through bolts. The use of cast steel was avoided and the bolsters being made of commercial sizes of heavy plates and angles, could be and were riveted up complete in the bridge shops without the danger from delay that would have been encountered if they had been designed as steel castings and made by sub-contractors. It is a multiple web frustrum of a pyramid, 74 in. high, 18 x 20 ft. on the base and 11 ft. 9 in. x 13 ft. 2¼ in. on top, weighing 250,000 lb.

The 95,000-lb. upper part is 34 in. high, with 2-in. top and bottom plates and ten 2½x30-in. transverse web plates, with four 6x8x1-in. flange angles to each. The outer webs are each stiffened by nine ¾-in. transverse gusset plates. The two halves are butt-jointed on the transverse center line, midway between the center webs, and are secured together by ten 1⅛-in. bolts passing through all webs.



The New Pumping Station at Lardner's Point.

The 155,000-lb. lower part of the bolster is 40 in. high, with 2-in. top and bottom planed plates and ten regular longitudinal, I-shaped girders or ribs, each made of a 36x2⅜-in. web plate and four 8x6x1-in. flange angles. The eleventh rib has the same dimensions, but, being on the center line, is cut by the plane dividing the two halves of the bolster, and is therefore made of two separate built channels each composed of a 36x1 3/16 in. web and two 8x6x1-in. angles. The backs of these channel webs are held in contact by the sixteen through bolts like those in the upper part of the bolster. Each outer rib is braced with fourteen transverse vertical gussets or knee braces, and the base plate is secured to the masonry by thirty 1⅝-in. anchor bolts 2½ ft. long with expansion wedges at the bottom.

Tests made at the Watertown Arsenal and experiments by the consulting engineer convinced him that a lead filler between the pedestal and the masonry is one of the worst forms of bearings, inasmuch as the lead has been demonstrated to flow under pressure and is believed to be forced into the pores of the stone where it produces a bursting force, thus breaking the stone with much less pressure than could be otherwise applied. A special bedding was therefore devised for these bolsters, designed to equalize any inequalities in the surfaces, distribute the pressure uniformly and provide a seal between the steel and the stone work. Each pedestal is bedded on two thicknesses of No. 1 cotton duck, the bolts of which are crossed and sewed together without overlap on the edges, so as to lie flat and extend beyond the edges of the bottom of the bolster. Each layer of canvas was painted with two thick coats of pure linseed oil and red lead, applied with a stiff brush and allowed to set but not harden before the bolster was placed on it. The top surface of the canvas was given a final coat of paint and enough paint was used to exude around the edges of the base plate and seal it with the masonry.

The bridge is being constructed at a total estimated cost of nearly $4,000,000 for the Quebec Bridge & Railway Co., Hon. S. N. Parent president, Mr. E. A. Hoare chief engineer, and Mr. Theodore Cooper consulting engineer. The main piers and aproaches were built by Mr. M. P. Davis, of Ottowa, Mr. A. A. Stuart acting as his chief engineer. The contractor for the steel work and erection is the Phoenix Bridge Co., Mr. David Reeves, president, Mr. John Sterling Deans chief engineer, Mr. P. I. Szlapka designing engineer, and Mr. A. B. Milliken superintendent of erection. The design and all shop drawings are verified and approved in the office of the consulting engineer, Mr. Bernt Berger, chief of staff, and the shop details have been prepared under the direction of Mr. Charles Scheidel.

Rapid Construction has marked the reconstruction of the Stuyvesant docks of the Illinois Central R. R. at New Orleans. On the night of Feb. 26 they were completely burned. Since then a 1,500,000-bushel elevator has been built, one of 1,000,000 bushels is nearly finished, a 100 x 1,000 ft. warehouse has been completed, a 100 x 1,200-ft. warehouse is three-quarters completed, 3,500 x 150 ft. of wharf property has been built and part of the wharf sheds erected, and a 140 x 2,100-ft. cotton warehouse is about three-quarters done. In all this reconstruction, the work has been of the highest class. The equipment of the elevators has been improved so that grain can be handled at much less expense than formerly, the warehouses contain no combustible materials whatever, and the design of the wharf has been much improved. The reconstruction has been done by the George B. Swift Co. and James Stewart & Co., and has called for 13,000,000 ft. of lumber, 3,000 tons of steel, 8,000,000 brick and 300,000 cu. yd. of concrete.

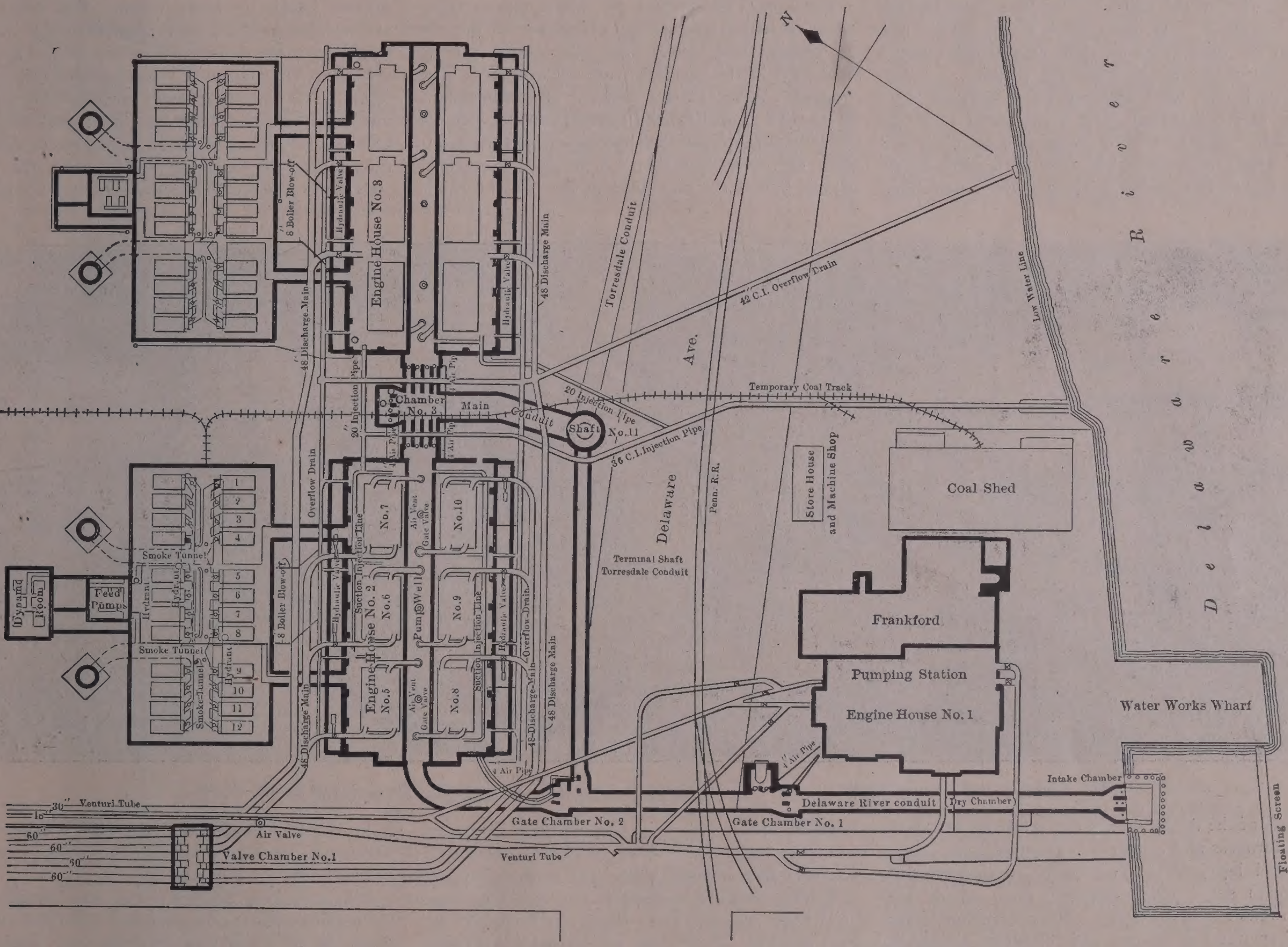
The New Lardner's Point Pumping Station, Philadelphia.

Numerous articles have been printed in these columns in the past two years concerning the extensive improvements in the water works of Philadelphia. Of these improvements the Torresdale filter plant is the largest single feature. It is located 11 miles by air line from the City Hall in a low-level district adjacent to the Delaware River, from which the raw water supply is taken. The filtered water is delivered by gravity to the pumping stations at Lardner's Point, about 3 miles down the river toward the city, through a conduit 10½ ft. in diameter, in tunnel throughout, and from there is pumped to the city.

The accompanying ground plan of the pumping station shows the arrangement of the new plants at Lardner's Point in their relation to the original Frankford pumping station, formerly operated there to deliver raw water directly from the river to the city mains. The new pumping installation provides for two independent plants, each with six 20,000,000-gal. Holly triple-expansion pumping engines, so that the entire station, including the old plant, will have an ultimate total capacity of about 290,000,000 gal. per 24 hours. The new installation is in two plants with independent boiler and engine houses in order to secure an independence of action likely to favor the reliability of the service. The old plant contains four engines, two built by the Southwark works, one Cramp and one Worthington, aggregating 50,000,000 gal. capacity; these are being rebuilt and will be retained in their present location, together with the direct intake connection at this point from the Delaware River, for purposes of reserve. One of the new pumping plants has been entirely completed and is in full operation, having displaced the old plant, and the second new plant is well under way.

Buildings.—The boilers and engines of the new plants have been located in separate buildings, spaced 40 ft. apart, with a tunnel connection for carrying the steam and other piping across to the engines. By this means the work in the two buildings is separated and individualized, and it has been possible to adapt the design of the buildings very closely to the requirements of the work. Both buildings are of steel frame construction with concrete foundations and side walls of buff brick trimmed with granite and terra cotta. The engine house is 176x92 ft., with a height from basement to roof trusses of 70 ft.; of this 20 ft. is devoted to the basement, in which the water ends of the engines are located. This basement is well lighted by areaways 7½ ft. wide by 10 ft. deep below ground level, along each side of the building, from which windows open directly to the basement. The engine room floor between the engines is also provided with hatches which may be lifted for light and ventilation and also for handling heavy pieces of machinery to and from the basement by the crane direct. The entire floor of the building is traversed by a 30-ton Niles electrically operated traveling crane of 85 ft. span, running on crane tracks 40 ft. above the floor level. The roof is surmounted by a copper-mounted lantern of ornamental design, for lighting and ventilation, and the whole is covered with a roofing of red tile.

The boiler house for each of the plants is of similar construction to that of the engine houses, but is somewhat smaller, treated more simply architecturally, and only a single story high. It is 165x85 ft., with a clear height under the roof trusses of about 25 ft. A marked simplicity of interior arrangement is secured by the use of underground smoke flues which results in free overhead room and a light and convenient interior to work in. Each of the boiler houses has at the rear an extension 35x45 ft. in size, which serves for the pump room and a combined locker and toilet room; the pump room occupies a space 25 ft. square inside, while the locker and toilet rooms take up the remaining space in the addition, as shown in the plan. Merritt expanded metal lockers are provided for the clothes of the workmen. At the rear of the extension behind boiler house No. 2 there is a 28x43-ft. dynamo house housing the electrical generating equipment used for the lighting and general small motor power supply throughout the various buildings.



Detail Plan of the Old and New Pumping Stations and Arrangement of Conduits.

Boilers.—Each house is to have 24 200-hp. boilers of a special marine type arranged with simple settings, in two rows of 12 each, along opposite sides of the house, with a common firing aisle between. Each row is divided into three batteries of four boilers each, so that the general arrangement into six batteries corresponds to that of the arrangement of the six pumping engines in each engine house. The type of boilers used, a combined furnace flue and tubular (gunboat) type, was selected as involving many advantages of durability, regular steaming qualities and other features which commend them for this class of service. They were designed, built and installed by the I. P. Morris Co., of Philadelphia, as sub-contractors under the Holly Mfg. Co. general contractors for the machinery installation.

Each of the boilers is 9 ft. in diameter by 20 ft. long over all, and contains two 7-ft. Morison suspension furnaces with a large combustion chamber at the middle common to both and 195 3½-in. tubes extending to the rear head. The furnaces are 42 in. in diameter inside, while the combustion chamber is 42 in. deep by 52 in. high inside. The tubes are 9 ft. 3 in. long between tube sheets, 22 of them being of ¼ in. thickness for use as stay tubes. Steam is delivered from a steam dome, 36 in. diameter by 36 in. high inside and double-riveted throughout, which is located on top of the boiler shell, above the tube section. The rear head of the boiler is covered by an external smoke box which is arranged to direct the products of combustion from the tubes down to the return passage in the setting beneath the boiler shell which deliver to the main flues leading to the stack. The back head of the smoke box is in the form of an air-tight door which permits of easy access to the tubes for cleaning.

The boilers were designed for a working pressure of 160 lb. gauge, with a net factor of safety of five. The shell is built up of 1-in. plate and the heads of ⅞-in. stock. The shell girth seams are double-riveted lap joints and the longitudinal seams of the double-butt strap, triple-riveted type; the furnaces and combustion chamber have single-riveted lap joints. The heads are braced with through stay rods having cap nuts outside and jam nuts inside the plates. The combustion chamber spandrel is braced with crowfeet riveted to it and held by pin connection to jaws on the ends of through braces extending to the front head with nuts on inside and out. An interesting system of stiffening was resorted to for the bracing of the flat sides and top and bottom surfaces of the combustion chamber; the crown is carried by ten plate girders, each with five supporting bolts, the sides with screw stays, and the bottom with four steel plate girders riveted to the shell, as shown in the detail drawing.

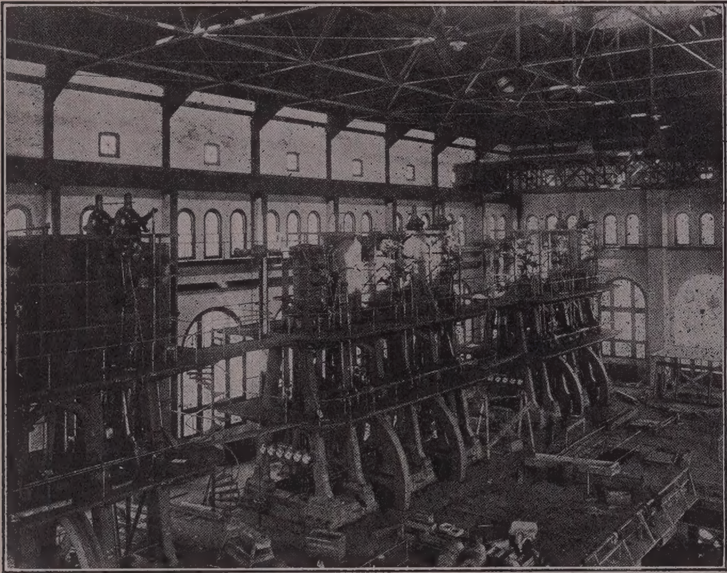
The boilers are arranged for hand firing, coal being delivered to the firing floor by means of cars on a narrow-gauge system of tracks leading in from the coal storage. There are two lines of the track through the boiler house, one for each row of boilers, and there are several cross-overs to enable cars to be shunted by each other for delivery to any boiler front. Each boiler is fitted with herringbone grate bars with serrated edges, which are made in lengths of about 5 ft. 8 in. This makes a total grate area of 40.25 sq. ft. per boiler. The total heating surface of the boiler (based on the internal area or fire sides of the tubes) is about 1,811.5 sq. ft., so that the ratio of the grate surface to heating surface is 1 to 45. Each boiler is designed to evaporate 6,000 lb. of water per hour from a feed water temperature of 100° Fahr. into steam at 160-lb. gauge pressure, delivered with an entrainment of water in the steam not to exceed 2 per cent., or the equivalent of this capacity—a capacity of over 200 boiler horse-power. They are guaranteed to utilize 70 per cent. of the calorific value of the coal when running at the above capacity, with a coal used under test of the semi-bituminous class containing at least 14,000 B.t.u. as determined by the calorimeter test; the above capacity is based on the ability of the chimney draft to effect a rate of combustion at the grates of at least 20 lb. of coal per sq. ft. of grate area per hour.

Flues and Chimneys.—An interesting arrangement of boiler settings has resulted from the use of underground smoke flues and connections, as indicated in the accompanying illustrations. The boilers are set almost entirely above the floor level with fire-brick-lined openings in the settings directly beneath the shell through which the products of combustion are led from the external smoke box at the rear head forward to the chimney flue connections, thus keeping them in contact with the boiler as long as possible. These connections beneath the boiler are 6 ft. wide and 4 ft. deep and are spanned at two points by cast-iron body supports upon which the boiler is carried directly. These flues are carried down under the front support and through a damper to the main chimney flue, which is located beneath the passageway between the boiler fronts and extends, one from each battery, toward the middle of the house to the underground connections to the stacks. Each flue is 4 ft. 9 in. wide by 6 ft. 7 in. high, and the stack connections 8½ ft. wide by 7½ ft. high. Each of the battery flues is provided in its connection to the stack flue with a tight-fitting damper, operated from the floor, by which it may be effectively isolated for cleaning or repairs.

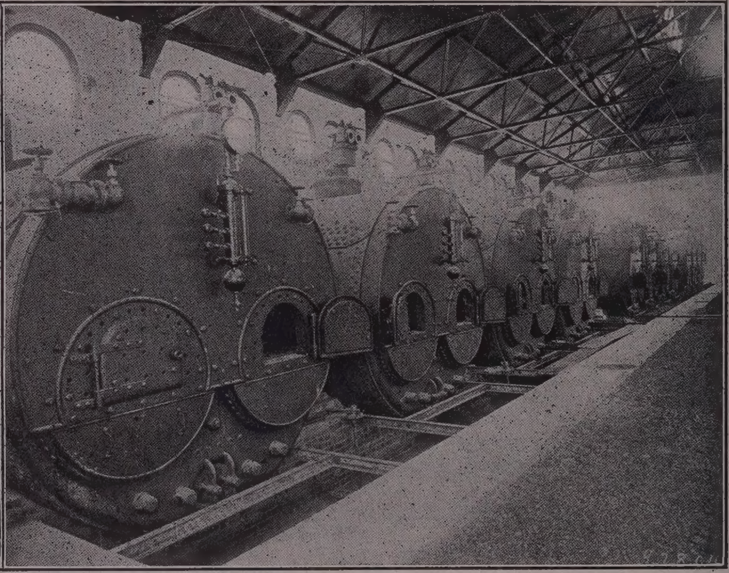
The chimneys, of which there are two for each boiler plant, are of Custodis construction, 150 ft. high, and have a minimum opening of 7 ft. in diameter. They rest upon concrete foundations 28 ft. square and 10 ft. deep. The first 10 ft. of the stack above the base is square in section, above which the round section, 15½ ft. outside diameter, begins; above this the stack was built in six sections, of uniform thicknesses of 29 in., 25 in., 21 in., 17 in., 13 in. and 9 in., respectively, advancing toward the top. The interior is lined with fire brick to a height of 69 ft. above the floor of the connecting flue, with a liberal air space opening between the lining and chimney. The tops of the stacks are capped with cast-iron ring coverings of eight sections bolted together, which are of U-shaped cross-section, thus effectually protecting the top courses from the weather.

Coal Supply.—The coal supply for the entire station will eventually be maintained in a large coal storage building to be located directly to the north of pumping plant No. 3, from which delivery will be made to the firing rooms by means of a system of narrow-gauge tracks and dumping cars. The tracks are already laid in the firing rooms in two lines, one in front of either row of boilers, and are now being used in connection with a temporary system leading from the old Frankford plant coal storage building, from which the present supply is being taken. The temporary system also includes an extension to the rear of the site for the dumping of ashes, where there is a low, marshy tract that will require several years to fill. The new system will provide a more complete and effective arrangement of coal and ash handling, including elevated coal pockets and arrangements for dumping directly into the cars, while the ashes will be stored as they accumulate in an elevated hopper near the river's edge from which they may be dumped either into scows or railroad cars for removal.

Boiler Feeding System.—The feed system for the boilers consists of a duplicate system of pumps involving the usual type of cross-head pumps on the Holly pumping engines, which are used normally, and reserve steam-driven duplex pumps in the pump room at the rear of the boiler house. Each of the pumping engines has an attached feed pump of a capacity sufficient to supply one of the batteries of boilers, while in the pump room there are six independent Snow feed pumps in duplicate of those on the main engines. The main engine pumps take their suction from the hot wells of the condensers, and force, first through primary feed water heaters in their exhaust pipes, to the boiler house delivery system. For the independent feed pumps two 3½-in. suction lines are carried over from the primary heaters to the pump room. It is intended to use the cross-head pumps on the main engines for boiler feeding under normal conditions of operation, although in case of repairs or other emergency the reserve equipment of independent feed pumps in the pump room at the rear will provide a sufficient capacity to take care of the operation of the entire



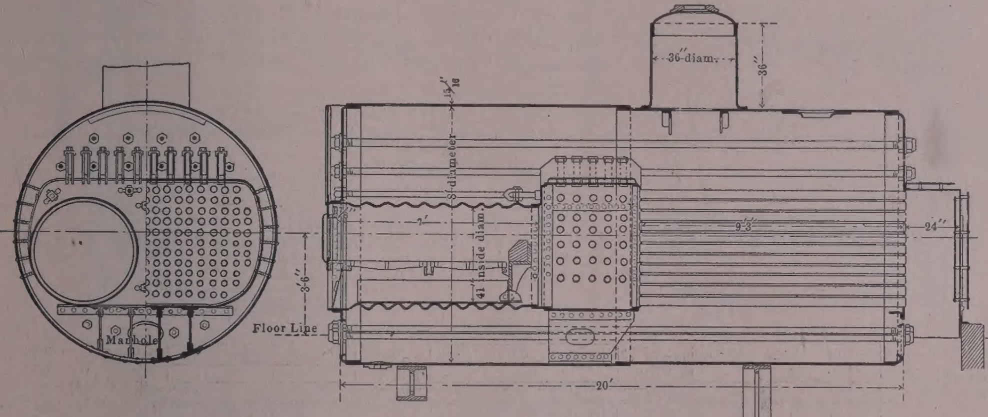
The Completed Pumping Engines.



View in the Boiler House.

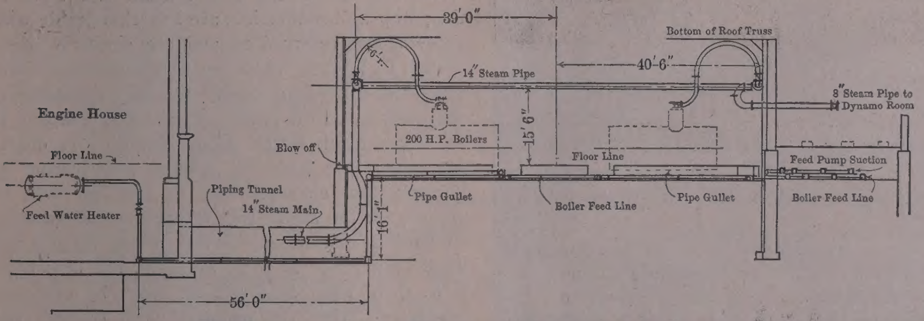
boiler plant independent of all of the main engine pumps.

Piping Systems.—The steam piping system which has been installed in connection with the particular arrangement of boilers adopted has proved simple and accessible. It consists of two cross-headers of 14-in. pipe extending across the building and through the two pipe tunnels into the engine house basement; from these branch header connections are extended along either wall of the boiler house at the rear of the rows of boilers to make connection with each battery. The branch headers are of 14-in. pipe between the main cross-headers, while on either side of these they are reduced to 10-in. pipe. The individual boiler connections are made through long-radius bends of 6-in. pipe, which are carried upward and then drop to the header, with an automatic stop valve at the boiler dome and a 6-in. gate valve next to the header. The main and branch steam headers are supported beneath the roof trusses at a height of 15 ft. 6 in. above the floor line.



The Type of Boiler Used at the Lardner's Point Pumping Station.

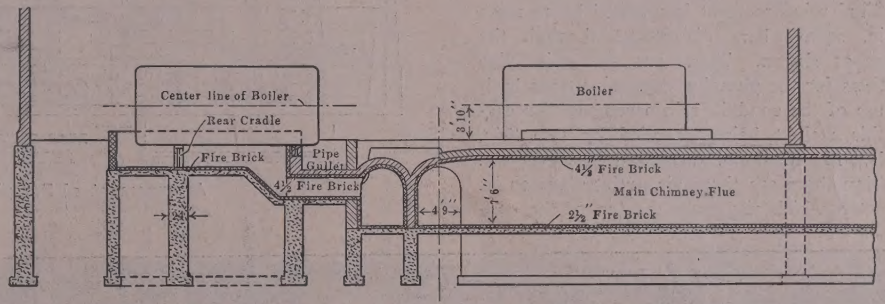
The main cross-headers, which connect the two longitudinal lines in the boiler room, each extend downward and through the tunnel to the engine room basement, there uniting with a ring header system extending entirely around the basement so as to provide connections to each engine. The engine branch connections are of 8-in. pipe with the gate valve next to the ring main and rise 41 ft. to the throttle valve connection at the high-pressure cylinder. The ring main in the basement consists of 14-in. pipe between the two cross-header connections, so that either cross-header from the boiler room may be used alone to feed the ring system, and is then reduced on either side to 12-in. pipe and on the opposite side to 10-in. On the rear side of the boiler house an 8-in. connection is carried back in an opposite direction to supply the auxiliary boiler feed pumps and the electric light plant in the engine room. The entire steam piping system has an 85 per cent. magnesia covering.



The System of Steam Piping and Pipe Gullets in Floor.

The boiler feed and blow-off piping has been conveniently concealed in a system of special pipe trenches or gullets beneath the boiler room floor, which are covered with checkered cast-iron floor plates, so that, while the piping is entirely concealed, it has not been rendered inaccessible. The gullets are in general 30 in. deep and from 3 to 5 ft. wide, according to location, in order to provide accessibility to all valves and special fittings. They extend crosswise of the boiler house, similar to the arrangement of the main cross steam headers, so as to make connections with the pump room at the rear and the pipe tunnels to the engine house basement on the opposite side, and have longitudinal branches extending immediately in front of either row of boilers. The gullets are brick and concrete and have been provided with drainage to prevent flooding in case of possible leakage in the piping.

The boiler feed piping consists of a system of 4-in. pipe with screw flange connections, laid out to correspond with the gullet system, including two main cross-headers with a longitudinal branch directly in front of either row of boilers. The system is fed through the two cross-headers from a 4-in. ring main system in the engine house basement, leading from the main engine feed pumps, and from the rear by two 3½-in. connections to the pump room. The individual connections to each boiler, which are of 2½-in. pipe, rise at the boiler front and enter at water level through a valve equipment consisting of two globe valves with the check valve between, thus permitting accessibility to the check valves when necessary.



Arrangement of Smoke Flues Under Boiler House Floor.

The system of blow-off piping is similar in arrangement to the feed system, consisting of two divisions, one in the pipe gullet immediately in front of either row of boilers. These are connected at the cross gullets to 4-in. outlet headers which lead to the condenser overflow line outside the basement of the engine house. The individual blow-off connections to each boiler are made through 3-in. branches and special blow-off valve, to the bottom of the shell at the front end. There is also arranged a surface blow-off connection in front of each boiler, which connection, of 2-in. pipe, is made near the normal water level and leads down to the blow-off header.

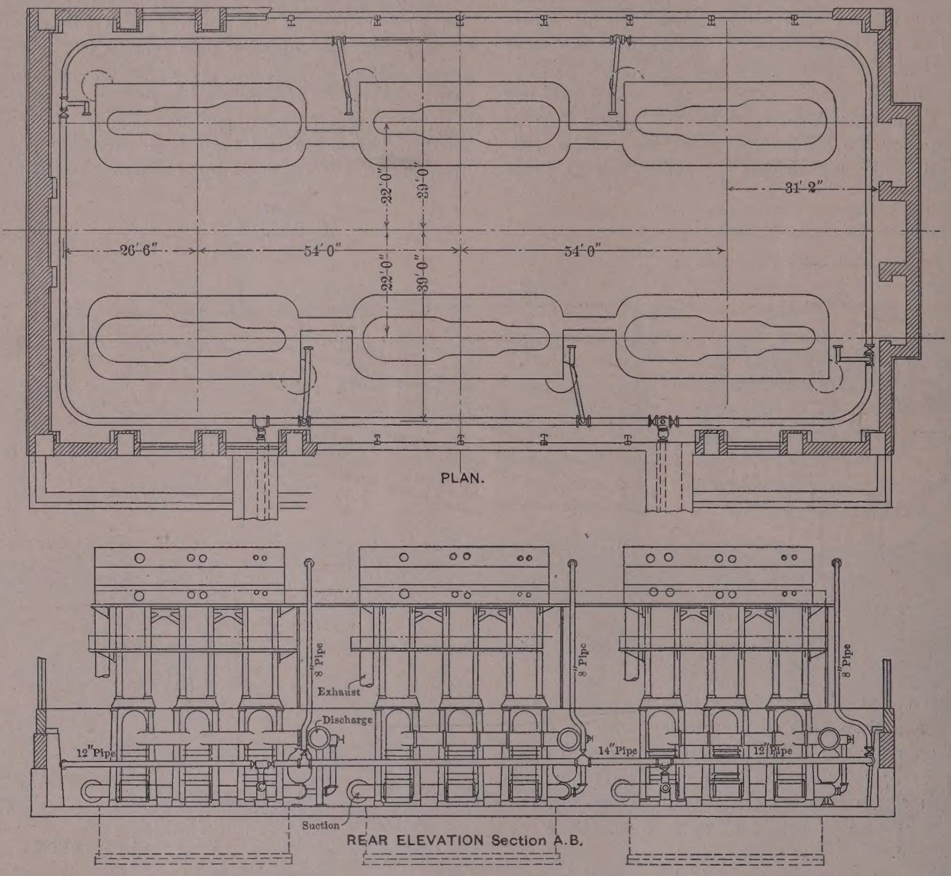
Pumping Engines.—The equipment of each plant consists of six vertical, triple-expansion, self-contained pumping engines, which have been built and installed by the Holly Mfg. Co., Buffalo, N. Y. These engines have been specially designed for accessibility to all parts and have been so arranged that all the pump parts may be removed without disturbing the superstructure and entirely without the use of temporary supports. The pump valves are mounted on cast-steel valve decks which are independent of, but are bolted to, the main pump castings. There are three pump cylinders, each 33 in. in diameter, of the single-acting, outside-packed type arranged vertically below and in a direct line with the steam cylinders.

The steam end of the engines consists of cylinders 32, 60 and 90 in. in diameter, with a common stroke of 66 in. and has been designed for a piston speed of 220 ft. per minute. There are two main fly-wheels between the cylinders and the speed of the engines is regulated by a fly ball governor driven directly by gears on the lay shaft of the engine. The valve portion is of the Corliss type with the exception of the exhaust valves for the low-pressure cylinder, which are of the poppet type. The inlet and exhaust valves of each cylinder are driven by separate eccentrics located on a lay shaft, which is driven by return-crank connecting rods from the main high-pressure and low-pressure crank pins. The engines, when operating under 160 lb. steam pressure, are capable of pumping against a maximum total head of 255 ft. with a maximum duty guarantee from coal of 130,000,000 ft.-lb. Each engine has a capacity of 20,000,000 gal. per 24 hours.

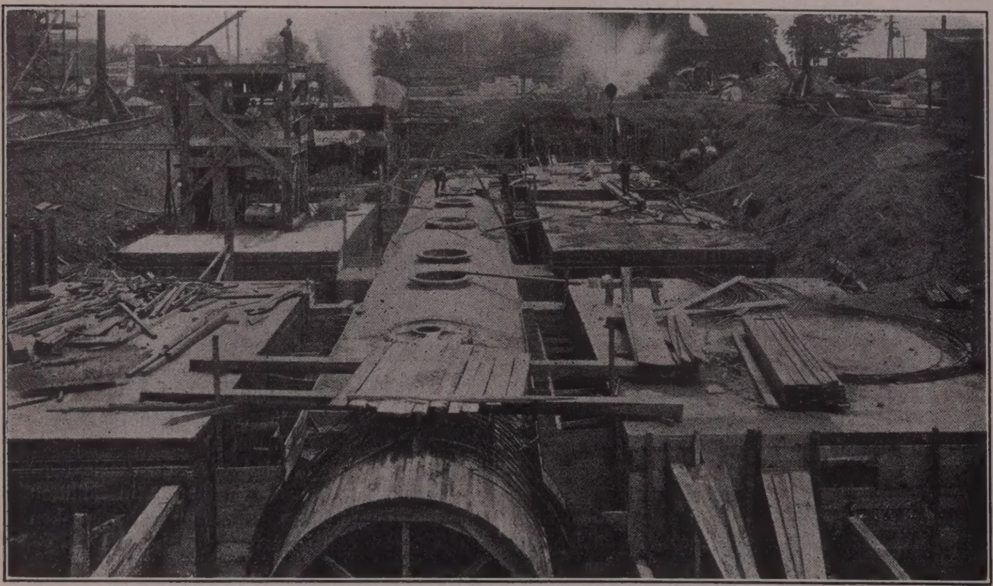
Each engine is provided with an attached air pump and jet condenser equipment in addition to the boiler feed pump. Injection water is taken from a 36-in. cast-iron inlet pipe leading from the river to the basement, around which it is extended in the form of a ring main for connection to each engine. The overflow connection is similarly arranged, but has a 42-in. outlet to the river, this additional capacity providing for boiler blow-off and waste from the plant. These injection and overflow connections to the river are of sufficient capacity to provide for both of the new pumping plants. Two Westinghouse compressors and a compressor driven from the high-pressure pump crosshead air to the chambers of the pumps.

Conduits.—The Torresdale conduit delivering the filtered water to the station ends in a shaft from which connections are made to the various plants. A connection known as the east conduit extends on beyond through gate chamber No. 2 to the Delaware River connection, so that filtered water may be thus delivered to the old plant. Delivery to the pump well of the new plant is made in two ways, one through gate chamber No. 2 and the other through a direct connection from shaft No. 11 through gate chamber No. 3. In this way the main engine house pump well has duplicate supply connections to provide for cleaning or repairs to either branch of conduit as required. The various gate chambers are also so arranged as to provide for thorough isolation of any section of the conduit and arrangements are made for quickly draining them if necessary. It will, in fact, be the practice to maintain the section of the Delaware River conduit between gate chamber No. 1 and the intake chamber dry at all times when not in use, in order to absolutely prevent intermixture of raw river water with the regular filtered supply from Torresdale.

The pump well in the engine house basement is incorporated in the building foundations in an interesting manner, as shown in the accompanying detail illustration. It is carried longitudinally through the center of the basement foundation in the form of a 14-ft. conduit with its top 18 in. below the basement floor level. This conduit is of reinforced concrete 14 ft. wide and 13 ft. high, with a minimum thickness of 12 in. at the top, which increases to 24 in. at the sides and the bottom. The walls are reinforced transversely by double rows of 13/16-in. square steel bars located at 12-in. centers, one row curving to the contour of the walls within 2 in. of either face; longitudinal reinforcement is supplied by 12 rows of ½-in. square bars distributed through the structure as shown. There are six 42-in. pipe connections for the pumping engine suctions built in the top of the conduit, reinforcements for carrying this weight being supplied by two 8-in. channels, 16 ft. long, arranged transversely. In addition there are three air outlet pipes 20 in. in diameter, which rise from the top of the conduit to a height of 18 ft., for the purpose of freeing the well of air and water-hammer effects.



Arrangement of Pumping Engines and Steam Piping.



The Engine Foundations and Pump Well Under Construction.

Gate chamber No. 3, located in the space between the engine houses, is of interesting construction, embracing gate connections between three sections of 14-ft. conduit and providing also for a 12-ft. connection toward the rear for conduit extension to possible future plants. This gate chamber forms the principal connection between the Torresdale delivery shaft and the pump wells of the two new engine houses. It is of reinforced concrete construction throughout with underground galleries which afford access to the gate-operating mechanisms. There are four gates in each branch opening, each gate controlling a rectangular section, 3 ft. 4 in. by 6 ft. in area, which sections are separated by 24-in. walls. The gates are of cast-iron construction, heavily ribbed, and slide in carefully machined brass guides, thus affording tight fits without danger of seizure due to rust; the gates are elevated by means of large revolving nuts in the gate stands in the operating gallery above, which are revolved through hand crank and worm about the stationary screw shaft attached to the gate. Each set of gates is by-passed by a connection of 12-in. pipe and valve for filling empty chambers. The operating gallery extends across and connects with the basements of both of the engine houses, and has manholes opening upward to the ground level.

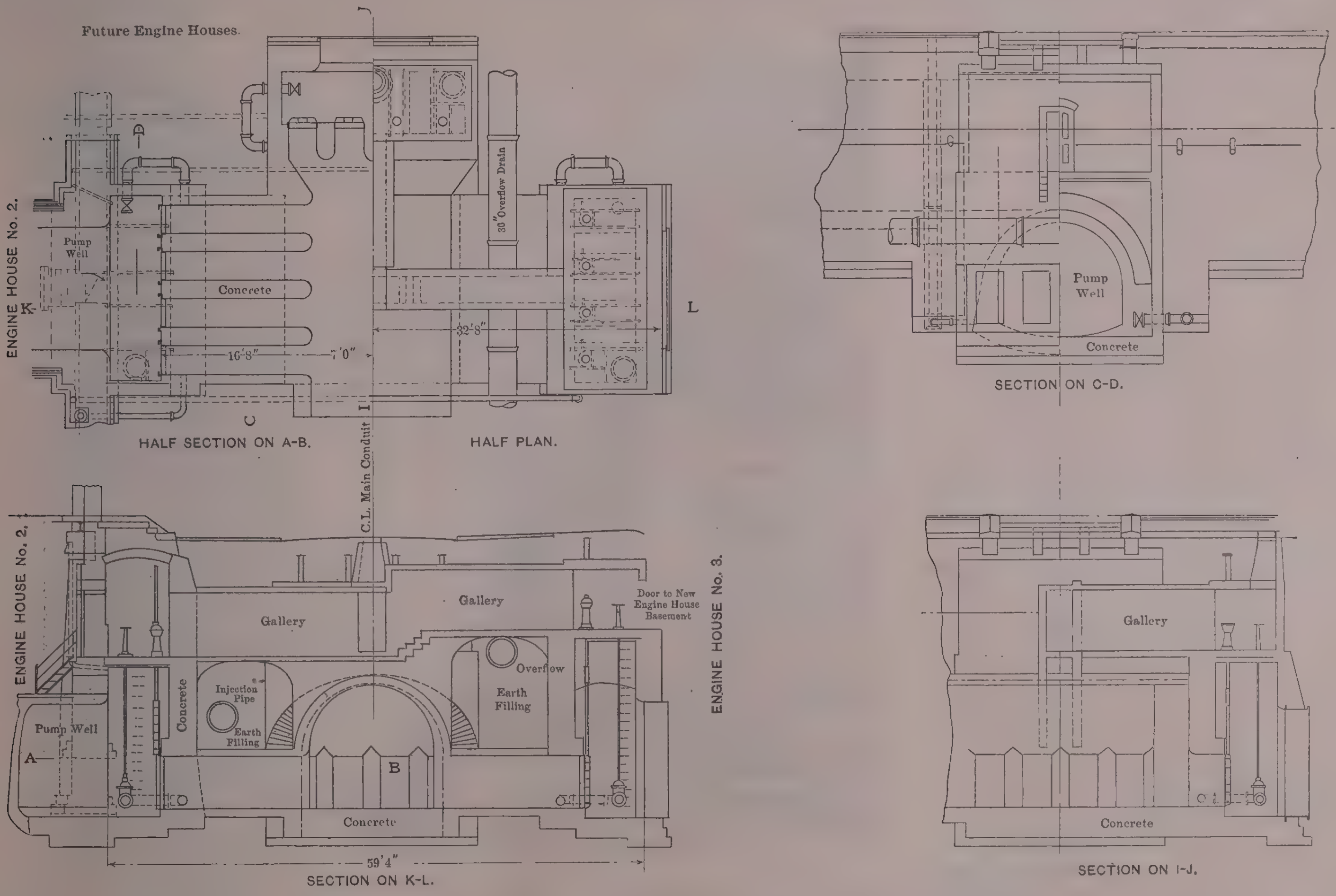
The other gate chambers are of similar construction in concrete, with individual gates opening 3 ft. 4 in. by 6 ft. sections, all controlled from underground operating galleries. Gate chamber No. 2, which connects the east conduit, 7 ft. in diameter, with the Delaware River conduit and the south end of the engine house pump well, both 9 ft. in diameter, is shown in detail. The gates, of which there are two in the east conduit and three in the pump well connection, are interchangeable with those above referred to and are similarly operated. Here also 12-in. by-pass connections are provided for filling empty sections to facilitate the opening of the gates. The intake chamber at the river front, which opens into the dry chamber, has three gates of similar construction as shown; this chamber has in addition sets of screens on the intake side to prevent the entrance of floating matter and débris. These screens are each built up of 24 3-in. by ½-in. flat iron bars, 6 ft. 9 in. long, spaced 2 in. apart by cast-iron separators; they are provided with channel bar guides, but no permanently installed hoisting apparatus for lifting them, as this connection to the river will never be used except in case of improbable accident to the Torresdale filter supply.

The entire installation at Lardner's Point was designed by the Department of Public Works. The work of construction has been under the supervision of Mr. John W. Hill, until recently chief engineer of the Bureau of Filtration, who has been succeeded by Mr. Geo. S. Webster, chief engineer Bureau of Surveys. Mr. Richard D. Ashbridge was the first assistant engineer and S. M. Swaab the assistant engineer in charge at the plant. The Holly Mfg. Co. was awarded the contracts for the installation of the pumping engines, which were designed by Mr. D. A. Decrow, chief engineer of the company.

Septic Tanks and the Glover Patent.

The Glover patent, No. 559,552, issued on May 5, 1896, has been claimed by the American Sewage Disposal Co., its owner, to cover the use of septic tanks. It has a single claim reading as follows:

"A sewage apparatus comprising a series of stationary primary filter-beds, a structure over said beds with provision for the removal of offensive gases therefrom, and a series of stationary secondary filter-beds located outside the said structure and arranged to receive by gravitation the effluent from the primary filter-beds, the said primary beds being constructed to discharge the effluent wholly through filtering material, whereby the offensive matter is retained in the structure and the effluent is clarified and partially purified, and whereby the said effluent may receive subsequent treatment in the open air by extensive secondary beds for any required length of time without offense."



Details of Construction of Gate Chamber No. 3, Lardner's Point Pumping Station.

The owners of this patent brought suit for infringement against the city of Pawtucket, claiming that its septic tanks were essentially the same as the "primary filter-beds" in the claim above quoted. A decision adverse to the company in the District Court was appealed to the U. S. Circuit Court of Appeals, where it has been confirmed by an opinion of much interest to municipal engineers.

In the decision of the court, written by Judge Colt, the meaning of the terms "septic tank" and "septic action" are considered first. The term "septic" is stated to have appeared first in the British Cameron patent of 1896, sixteen years after Glover made his alleged discovery of the septic tank and fourteen years after he took out his first patent. A still earlier description of the septic tank and septic process, although not under that name, is found in the French Mouras patent of Sept. 22, 1881, and the American Mouras patent of Nov. 28, 1882. From these and other sources mentioned in the opinion, the court rules "that the fundamental condition which characterizes the septic tank, and which differentiates it from the ordinary settling tank, is that the sewage shall remain in the tank for a considerable period of time in order that the bacteria of putrefaction may manifest their destructive activity, and so accomplish their work of decomposition and liquefaction. The second essential condition which marks the septic tank is that the contents of the tank must either be practically cut off from all contact with the atmosphere, or the surface of the sewage must remain quiescent for a sufficient length of time to permit the accumulation of a thick scum on the top, which operates to exclude the air and light. In other words, the tank must be built either airtight or so constructed with respect to its inlet and outlet pipes that the brown scum may be allowed to form on the exposed top surface. The necessary absence of air from the tank is due to the fact that the bacteria of putrefaction are destroyed by oxygen."

The first patent issued to Glover was dated May 30, 1882, and was for an invention "to enable sewage matter to be disposed of without danger of contaminating the soil by matter in suspension, or the air by gases and odors." The court decides that the tanks mentioned in this patent are wanting in the primal characteristics of septic tanks. "There is nothing in the patent which indicates that the sewage is to remain in the tanks long enough to cause liquefaction by the septic process. On the contrary, the specification says that in practice the 'wings' may be shut off one at a time in order to be cleaned. Again, the portion or quantity of the matter held in suspension which would be deposited in each tank would depend upon the rate and quantity of the flow, and whether it was continuous, and the patent is silent on these important subjects. The second vital condition inherent in a septic tank is likewise absent from these tanks, namely, the exclusion of the air. The patent expressly provides that a current of air shall pass over the tanks. It further expressly provides that the sewage shall overflow from the first tank into the succeeding tanks. We have, then, in these tanks neither the total exclusion of the air from the sewage, nor, in the alternative, such an undisturbed condition of the surface of the sewage as will permit the formation of the thick scum which operates to shut out the air. Since, according to Pasteur and other scientists, the presence of oxygen destroys the activity of putrefactive bacteria, it is manifest that the Glover tanks would not operate, in any proper sense, as true septic tanks. It may be observed in this connection that in the ordinary settling tank the line between sedimentation and septic action cannot be strictly drawn, for, if any portion of the sewage is permitted to remain for a considerable time in such a tank, there will be more or less fermentation, and this would be true of the Glover tanks. The question, however, is not whether there may not be some septic action in these tanks, as there may be in all settling tanks; but whether this patent discloses, or was intended to disclose, the practical septic tank of the sewage art for the disposal of sewage by the septic process. For these reasons we fail to find in this earlier Glover patent any intention to patent a septic tank, or any description of such a tank within the meaning of the patent law."

During the thirteen years between the issue of this patent and that which the city of Pawtucket was claimed to infringe, progress in sewage disposal was largely along the line of intermittent filtration. The court believes that Glover's mind ran in the same direction, for he seemed to consider two series of filter beds combined with substantially the ventilating structure of his first patent as the best disposal plant. "The only part of this later apparatus which, on the face of the patent, is like the tanks of his first patent, is what is described as a 'settling tank,' which is not shown in the drawings nor included in the claim of the patent." Before this 1896 patent was granted there was much correspondence between the Patent Office and Glover's solicitors, and the application was rejected three times before it was finally approved. The court decides, in view of the correspondence mentioned, some of which is quoted in the opinion, that "no other rational conclusion can be reached than that primary filter-beds mean primary filtering receptacles, and these receptacles cannot, upon any possible rule of construction, be interpreted to signify septic tanks. It is inconceivable that Glover should have disclosed septic tanks in his earlier patent, and then have intended to incorporate these tanks into the patent in suit under the name 'primary filter-beds,' and this in the face of the fact that he expressly states that his earlier tanks are not made a part of this patent. It is possible that there may be some septic action in this filtering-bed receptacle, just as there may be some action of this character in the ordinary settling tank. This, however, is immaterial, the question being whether these beds were intended to operate as septic tanks."

The court rules that the first Glover patent does not disclose the septic tank, and that the second Glover patent is for a system of rapid filtration, comprising two series of filter beds, one inside a ventilated structure and the other outside. It follows that the Pawtucket apparatus does not infringe the Glover patent in suit by using a septic tank or tanks in combination with filtering beds.

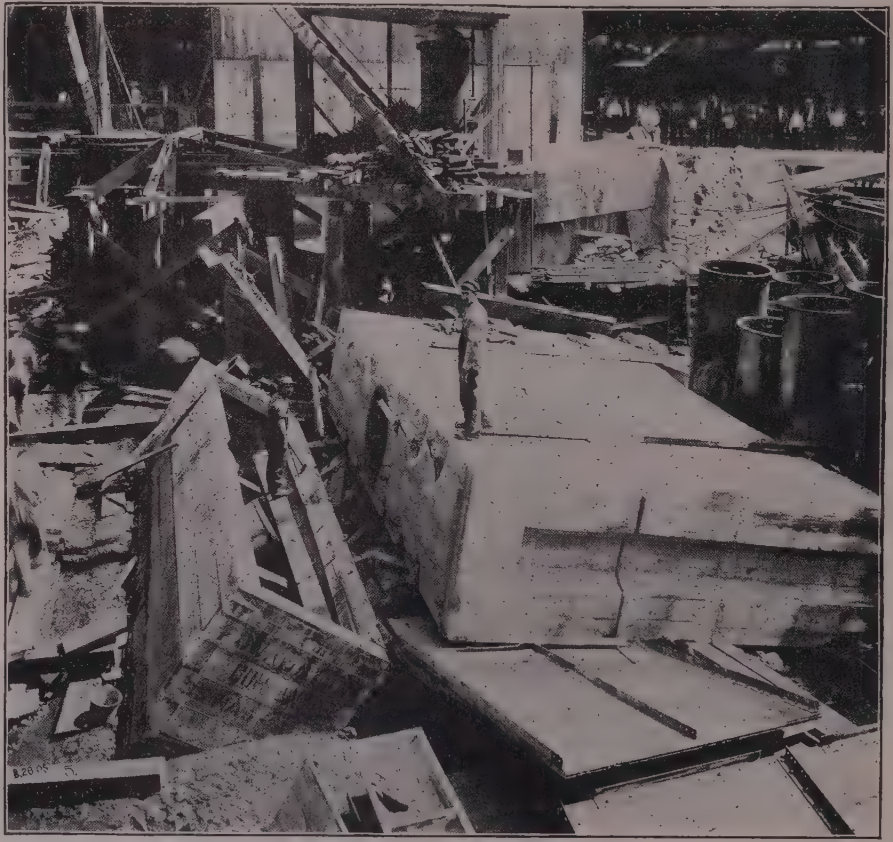
A Peculiar Pneumatic Caisson Wreck.

A curious and unusual accident occurred on Aug. 29 on the foundation work for the new United States Express Co. building, on Greenwich St., New York. The soil here is very wet and contains much quicksand, overlying the rock at a depth of about 49 ft. below high curb. All foundations are of concrete carried down to rock and in order to facilitate excavation and the construction of the substructure the lot is being entirely enclosed on the four sides by walls of solid concrete built in sections by the pneumatic caisson process and afterwards keyed together so as to virtually form a massive watertight dam which will exclude exterior water and act as a retaining wall within which the soil can be easily drained by pumps, and excavated to the required depths for the cellar and for the interior column piers without difficulty.

The general excavation had been carried down from 6 to 8 ft. below the curb, sheeting driven around the street sides, underpinning commenced where necessary for the adjacent buildings and several derricks installed to handle the caisson work which was well commenced and being rapidly pushed at the time of the accident, one caisson having been sunk and nine more in position at that time. The wall caissons are long and narrow, built of timber, completed at the contractor's yards and delivered whole to the site on trucks drawn by six horses. They are then swung from the street to position by the derricks and are sunk in the usual way by interior hand excavation and underpinning.

The caissons are special in that they have no permanent timber deck but are closed on top by the concrete pier itself which, contrary to previous custom, is built in place in detachable moulds before the caisson is sunk. By this method the concrete is more easily handled and its weight suffices to sink the caisson.

The wrecked caisson was 5½ ft. wide, 26 ft. long and 6 ft. high and consisted simply of four solid timber walls made of 6x12-in. yellow planed pine timber, lapped and bolted at the corners, and provided with a 10 x 10-in. chime timber around the top and a 10 x 10-in. corresponding bottom timber to which the 6 x 4-in. cutting edge angle was secured. The caisson was set in the required position on the bottom of the pit, levelled and a temporary roof of 2-in. transverse planks was built 2 in. clear, below the top of the chime timber, forming a floor for the concrete mould which was built on top of it with the walls in the planes of the exterior faces of the caisson. The long sides of the caisson were braced by four pairs of 10 x 10-in. transverse timbers at the cutting edge and half way above it and 4 x 4-in. horizontal transverse angles 30 in. apart were put across the chime timbers and fastened at each end by a single 1¼-in. vertical bolt passing through the full depth of the side wall and having a nut bearing on the under side of the cutting edge angle. The mould 18 ft. high was filled with 1:3:5 concrete mixed in a Ransome Machine and made with Atlas Portland cement. This had a total height of 24 ft. and a width of 5½ ft. and was braced by two inclined 10 x 10-in. shores on each long side. The concrete alone weighed about 200 tons which acted through its center of gravity 15 ft. above the bottom and only 2.75 ft. from the edge of the base.



Caisson and Concrete Pier After Latter Had Been Overturned.

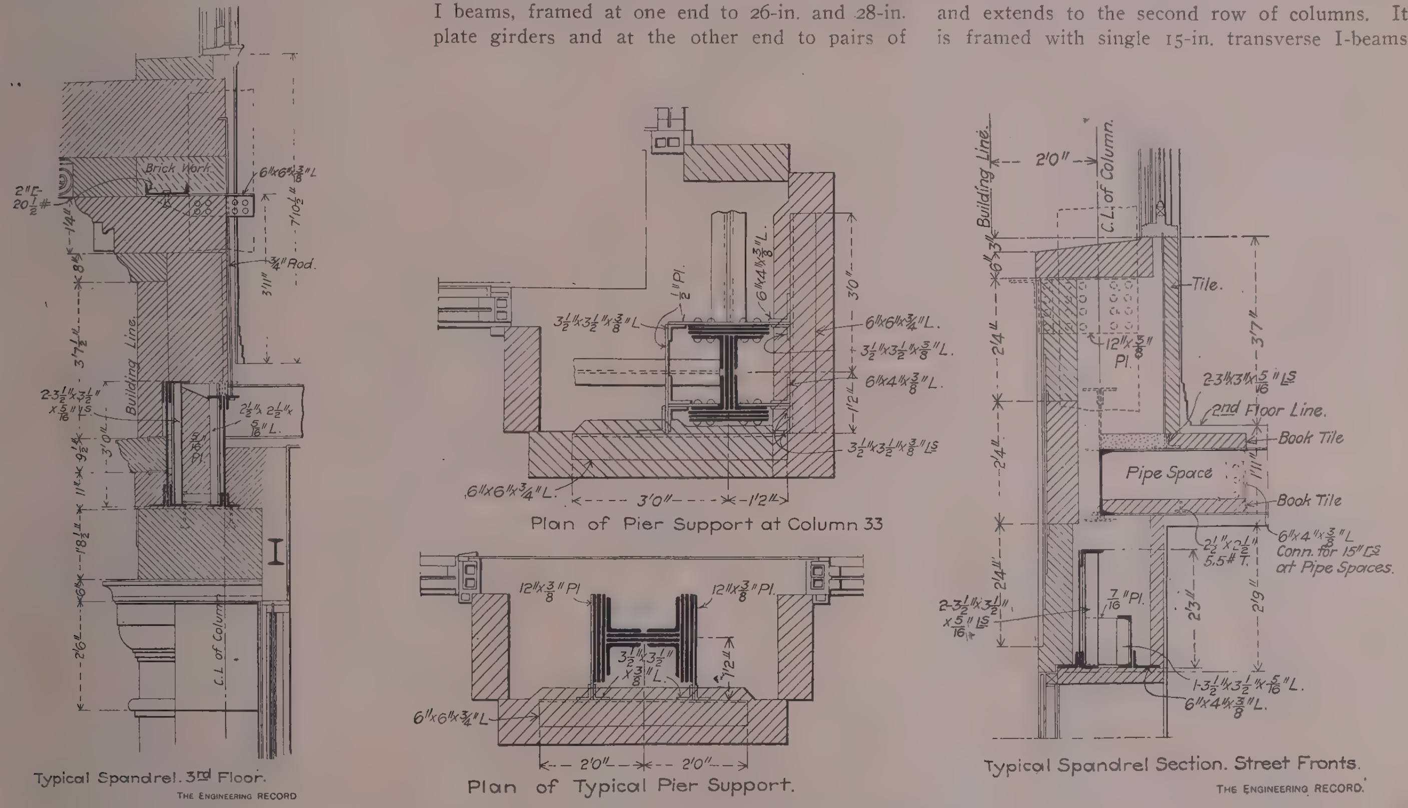
When the concrete was seven days old a gang of five "sand hogs" and a foreman entered the caisson under atmospheric pressure to "trench" it, *i.e.*, to undermine and excavate until the top of the working chamber sunk below the surface when the air lock would be put on the working shaft through which the excavated material had been freely hoisted, and air pressure being applied the work continued in the usual way. It was noticed that under the weight of the concrete the cutting edge had penetrated a little in the ground and had settled unevenly, throwing the sides out of plumb, the top of the concrete leaning a few inches to the north. To correct this the south side was undermined to a depth of about a foot in the usual way, but the caisson did not right itself and it was discovered that there was a bearing 5 or 6 ft. long near the middle of the south cutting edge on an old wall or footing. When this was broken away the caisson tipped so quickly back to the south that it passed beyond the vertical and displacing the feet of the shores on that side, rolled over. At an angle of about 45 degrees the caisson became wedged and stopped, but the top of the concrete pier above, moving with much greater velocity, acquired a great momentum and its inertia tore apart the bolts securing the transverse angles to the caisson walls, ripped the ends of the angles out of the concrete and thus freeing itself from the caisson revolved 90 degrees into a horizontal position falling clear of the caisson and resting, as seen in the picture, on one long side. The caisson was so badly racked and twisted that it was cut to pieces and a new one built for that place. The concrete endured the fall very well but cracked through in two planes parallel with the bottom surface, thus separating into the three portions which were placed in the mould on consecutive days with an interval of about 15 hours between laying each portion. As it was out of the question to handle this mass or restore it, it was broken up with bars and sledges and the excellent quality of the concrete was demonstrated by the difficulty with which it was broken up.

When the caisson began to fall the six men inside sat down quickly as ordered by their foreman, and escaped injury. There were two men on top of the concrete pier guiding the bucket into the shaft, one of them ran to the end of the concrete and as it fell clear jumped safely to an adjacent derrick platform, half of which was cut off by the falling mass. The other outside man seized the loose bucket rope and it paid away with his weight, lowering him inside the shaft as the concrete revolved. He was badly cut and bruised but not dangerously hurt.

The Express building will be 23 stories high. Clinton & Russell are the architects, Col. J. H. Wells is the consulting engineer and the Thompson-Starrett Co. is the general contractor, The Foundation Co. is the co-subcontractor for the foundations and excavation.

Steelwork of the Wanamaker Building, Philadelphia.—II.

All the floor plans are of very simple arrangement with regular rectangular panels conforming to the arrangement of the columns in transverse and longitudinal rows as described in the previous article. The distances between columns is about 22½ ft., except where columns are omitted to give unobstructed floor spaces. Here plate girders are used to span the long distances, elsewhere the columns are connected by transverse and longitudinal girders and beams made with 12-in. and 15-in. I-beams. The transverse girders are pairs of I-beams and the longitudinal girders are sometimes single I-beams and sometimes pairs of I-beams, connected as already described with horizontal reinforced shelf angles. In the regular panels the transverse girders carry web-connected longitudinal I-beams, about 6½ to 7½ ft. apart. When the latter are in the lines of the columns and are single beams they are connected directly to the column webs; when they are pairs of beams they are connected to the transverse beams.



Typical Spandrel. 3rd Floor.

Plan of Pier Support at Column 33

Plan of Typical Pier Support.

Typical Spandrel Section. Street Fronts.

Details of the Steelwork in the New Wanamaker Building, Philadelphia.

The floors are of Roebling flat arch construction, type B, leveled up with cinder concrete and covered with wooden wearing surface. They are proportioned for a live load of 125 lb. per sq. ft. and the columns are assumed to take full floor live load from the upper floor, 90 per cent. of the live load of the next floor, and so on, taking 10 per cent. less of the live load of each successive floor load until only half the live load is taken on all the lower floors. The floors weigh about 90 lb. per sq. ft., including about 12 lb. steel weight, and the steel in the I-beams is stressed to a maximum of 16,000 lb. per sq. in. in the extreme fibres, and connections are proportioned according to the regular standards with an allowance of 10,000 lb. per sq. in. shearing and 20,000 lb. bearing stresses in the shop rivets and 25 per cent. less in field-driven rivets.

The basement floor extends beyond the wall columns across the sidewalk vaults in which the beams are supported by the outer walls. Elsewhere the transverse girders are pairs of 15-in. I-beams and the longitudinal beams are single 15-in. I-beams, except in some column rows where they are pairs of 12-in. I-beams. The basement mezzanine floor extends around all sides of the building to the third row of columns, and is connected at the quarter points of the long sides of the hollow square thus formed by two transverse platforms about 45 ft. wide.

The first floor framing corresponds with that in the basement in the arrangement and dimensions of the beams and girders except outside the wall columns, where the sidewalk beams, normal to the curb line, are carried in most panels, at their outer ends on the vault retaining walls and at their inner ends are carried on single 15-in. I-beams spaced about 6 ft. from the wall columns and supported by girders consisting of pairs of 15-in. I-beams riveted to the columns at one end and seated on the walls at the other ends.

On the Juniper St. front there is also special construction for the porte-cochere floor about 66 ft. long which extends across the sidewalk and about 15 ft. beyond the wall columns. This floor is made of reinforced concrete on 18-in. and 20-in. I beams, framed at one end to 26-in. and 28-in. plate girders and at the other end to pairs of 20-in. I-beam girders. The lower flanges and webs of the I-beams are fireproofed with solid rectangular masses of concrete anchored to them by horizontal ¾-in. rods passing through the webs and engaging 6x6x⅜-in. vertical washer plates at both ends. These concrete jackets are integral with the 5-in. concrete slabs flush with the top flanges of the I-beams, and afford support for the latter on the lower flanges of the I-beams. The under surfaces of the concrete are finished with ½-in. hard plaster, and the upper surface is covered with a layer of dry cinders of variable thickness corresponding to the slope of the graded surface, with 1½ in. of rock asphalt and a 2-in. asphalt wearing surface. The sidewalk floor is made with segmental arches of red bricks, set edgewise against solid skewback blocks enclosing the lower flanges of the I-beams and leveled up with concrete 2 in. above the top flanges. The concrete is waterproofed with asphalt mastic, above which there is 3 in. of stone concrete with a 1-in. cement finish.

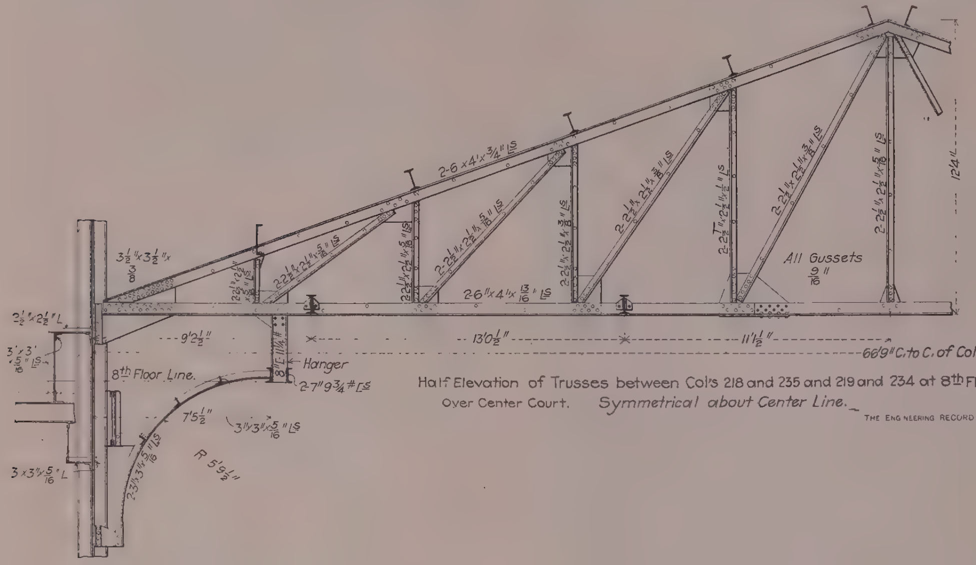
Where the vault walls are made with vertical I-beams the latter support the outer ends of the sidewalk beams. Deep beams are seated on three horizontal angles, one riveted on each side of the post web and one on the inner flange as indicated in the detail. When the sidewalk beams are less than 15 in. deep they do not extend across the tops of the vertical I-beams, but are seated on single angles riveted to the inner flange only. Where double 15-in. I-beams occur they are seated on pairs of 6x6-in. web angles with their horizontal flanges reinforced by vertical distribution angles. Where the I-beams are seated in the concrete walls they have horizontal cast-iron bearing plates under their lower flanges and short vertical angles are riveted to their webs at the end to lock into the concrete. One panel between columns is occupied by a fireproof vault with 19-in. solid red brick walls, and a roof and floor of two-course red brick segmental arches leveled up with concrete. The whole interior surface of the vault is lined with ½-in. steel plates.

The floor for the first mezzanine story consists merely of a platform around the walls of the building, about 22½ ft. wide, except in the middle of the long sides, where it is of double width and extends to the second row of columns. It is framed with single 15-in. transverse I-beams 7½ ft. apart, supported on single 15-in. I-beam girders. Above the first floor the six middle columns in the third and fourth transverse rows from each end of the building are omitted in every story and the floors there are carried at each end of the building on six plate girders, each of which is about 67 ft. long and carries a maximum load of 260,000 lb. from the 15-in. transverse I-beams web connected to it 7½ ft. apart. They are made with a 39x9/16-in. web, two 8x8-in. angles and three 20-in. cover plates in each flange and are riveted through end vertical connection angles to the column webs.

They project below the ceilings and are fireproofed by enclosing them completely with perforated tiles. Special tiles are made to fit the lower flanges and key together. They are set in cement mortar and form supports on which vertical walls of tile are built up to the under side of the floor on each side of the girder about 6 in. clear of the web, thus enclosing an insulating air space on all sides of the girder.

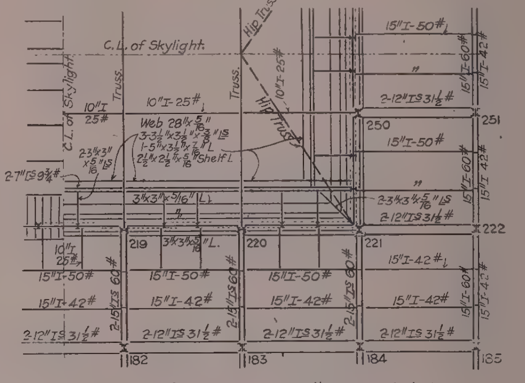
In the center of the building the two middle columns in each of four transverse rows are omitted above the first floor, so as to leave an open well or interior court occupying fifteen regular floor panels and making a 45x112½ ft. opening through all the upper stories. Three lines of beams or girders connect the columns bounding the sides of this court. The wall columns are connected by an inside beam or girder to carry the floor load only, and by a separate girder to carry the wall masonry. The dimensions and details of these members vary in different panels, but in general the inner member is a channel with an angle riveted to it or an I-beam, and the outer member is a plate girder.

The ashlar face masonry is made with thin slabs of cut granite, one course of which has the lower edge fitted to rest on and cover the lower flange of the girder, as shown in the typical spandrel section. A space of about 18 in. is left between the outer wall and the inside tile facing and affords room for the pipe lines and vent ducts. The wall girders have special top flanges made with an inside angle and the outside angle replaced by a vertical web plate to give clearance to the stone work. The stone work enclosing the wall columns projects beyond the face of the wall forming outside buttresses and is supported at every story on shelves made with single 6x6x½-in. angles riveted to bracket plates projecting from the intermediate columns, and to similar plates framed out from the corners of the corner columns as shown in the plans of pier supports, which are typical of all stories.



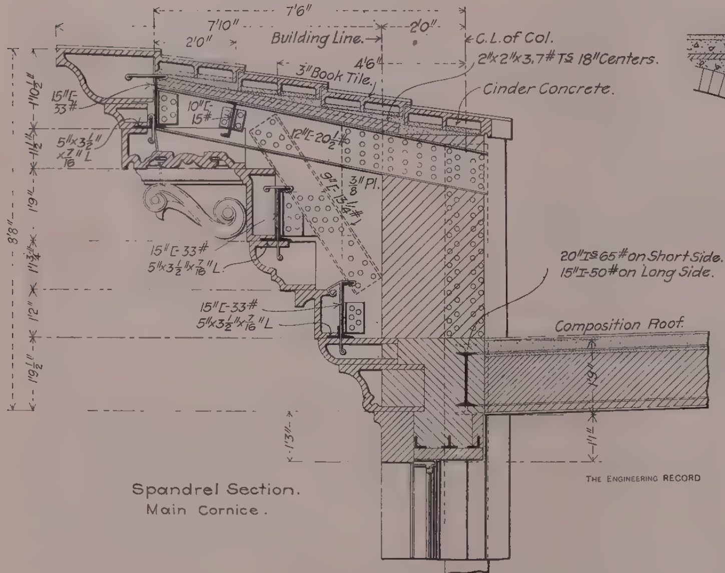
Half Elevation of Trusses between Col's 218 and 235 and 219 and 234 at 8th Floor, Over Center Court. Symmetrical about Center Line.

THE ENGINEERING RECORD



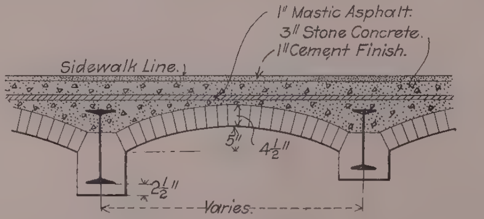
Half Plan of Ceiling under 8th Floor Skylight. Ceiling Symmetrical about Center Line.

THE ENGINEERING RECORD



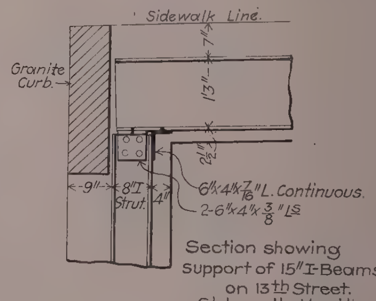
Spandrel Section. Main Cornice.

THE ENGINEERING RECORD



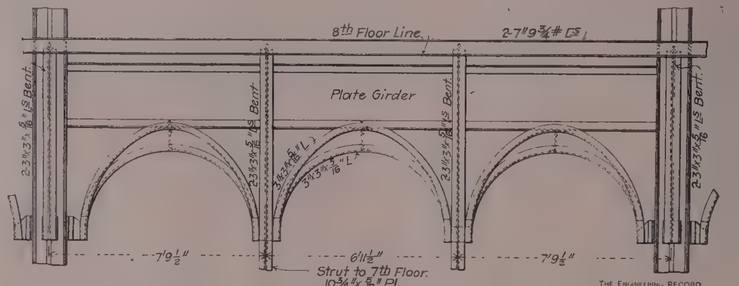
Section showing Sidewalk Construction.

THE ENGINEERING RECORD.



Section showing Support of 15" I-Beams on 13th Street. Sidewalk Vault.

THE ENGINEERING RECORD



Elevation of Ls supporting Arches on Long Side of Court.

THE ENGINEERING RECORD

Details of the Steelwork in the New Wanamaker Building, Philadelphia.

The second story mezzanine floor consists of a strip one panel wide, reaching from the wall columns to the first interior row on both the long sides of the building and two connecting transverse strips, one panel wide, at the quarter points, which, as in the other mezzanine, contain the elevator shafts and platforms.

At the third floor there is in the outer wall a projecting belt course of solid masonry supported as shown by the typical spandrel detail by two parallel plate girders. The upper course of stones cantilevers more than half its width beyond the face of the wall and is fulcrumed on a horizontal continuous channel carried by cantilever angles from the wall columns. The channel occupies a space at first left open behind the face stone of the second course and afterward filled in solid with brick. The rear ends of the cantilever stones are anchored to the flanges of the plate girders with long vertical bolts hooked at the upper end and having nut bearings at the lower ends. Similar short horizontal bolts are laid in the course joints to secure the face stones to the web of the outside girder, and the heavy window-cap stones under the girders are supported from their lower flanges by vertical bolts with nut bearings at the top and expansion wedges at the bottom, a method used frequently in the spandrel wall stones of this building.

In the fifth to the eighth stories inclusive, the ballustrade around the interior court is different from that in the lower stories and is supported from a girder made with a 15-in. channel having a flange angle riveted to the lower edge of the web as shown in the spandrel detail. The upper courses of the terra-cotta blocks here are anchored by hook bolts engaging the top flanges of the floor girders and the latter have vertical angles riveted to their bottom flanges to receive channels from which the wide lower blocks of terra-cotta are suspended by hook bolts. In the fifth and sixth stories there are balcony galleries with overhanging terra-cotta courses around the inner court which are supported by cantilever beams transverse to the wall girders. The outer ends of the cantilevers are connected by light fascia channels with flange angles for the support of the hollow blocks, and their inner ends are connected on the sides of the court to the next line of floor beams which take the upward reactions. On the ends of the court they are parallel to the regular floor beams and are eccentrically connected to their webs by transverse diaphragms. The piers around the court wall columns at these stories are supported on transverse and diagonal horizontal short angles laid across the top flanges of the wall girders.

In the eleventh story the wall column piers project nearly 2 ft. beyond the face of the wall and are carried by a system of wide horizontal angles connected to the columns and to the wall girders, which latter are set back from the column centers, by deep vertical plates forming three sides of a rectangular sleeve which engages the column flange.

The building is entirely covered by a flat roof with gentle drainage slopes except over the center court, which is open to the sky and at the end spaces, where the groups of interior columns are omitted and the floors below are carried on longitudinal plate girders. Here there are 67½x133½-ft. hipped skylights supported by steel trusses. There are also four small square skylights in the central part of the roof, each occupying one panel between columns. The regular roof panels each have three 12-in. longitudinal beams 7½ ft. apart. The roof beams support hollow tile arches covered with cinder concrete and waterproofed and proportioned for a live load of 30 lb. per sq. ft.

The tops of the outer walls are finished with a wide overhanging terra-cotta cornice supported on double cantilever brackets at each wall column. The cornice projects nearly 8 ft. beyond the face of the wall and nearly 10 ft. beyond the column centers, weighs about 3,000 lb. per lin. ft. and is regular around all fronts of the building. The terra-cotta blocks forming the soffit are made in light, small sections, anchored to three lines of horizontal channels which have flange bearing angles riveted to their webs, and are connected to the cantilever frames. The flange angles are fillered out from the channel webs so as to leave clearance between them for the vertical suspension and anchor bolts. The cantilever brackets are made with large rectangular gusset plates riveted to the column flanges and receiving on opposite sides the backs of the large channels. The column tops extend about 5 ft. above the roof surface and the walls between them form parapets protecting the roof. From the top of the wall to the end of the cantilever brackets the entire upper surface of the cornice is roofed with solid flat tiles, covered with stepped book tile, laid in cement mortar and supported on transverse 2x2-in. T-bars 18 in. apart.

At the eighth floor the center court wall columns are connected by plate girders that carry the outer walls of the upper stories. Vertical struts about 7 ft. apart connect these girders with the seventh floor and divide the wall space into panels with arched ceilings transverse to the court walls and corresponding to the curved furring angles shown in the side elevation. These arches penetrate the groined ceiling suspended from the skylight roof trusses. The skylight roof has four transverse trusses connected directly to the columns, and two hip trusses of similar construction at each end. The transverse trusses are 66 ft. 9 in. long on column centers and 12 ft. 4 in. deep, made with pairs of 6x4-in. angles for the top and bottom chords and pairs of 2½-in. angles for the web members. Each one weighs about 8,000 lb., was shipped in two pieces, field-spliced together and hoisted whole to position and erected by derrick booms.

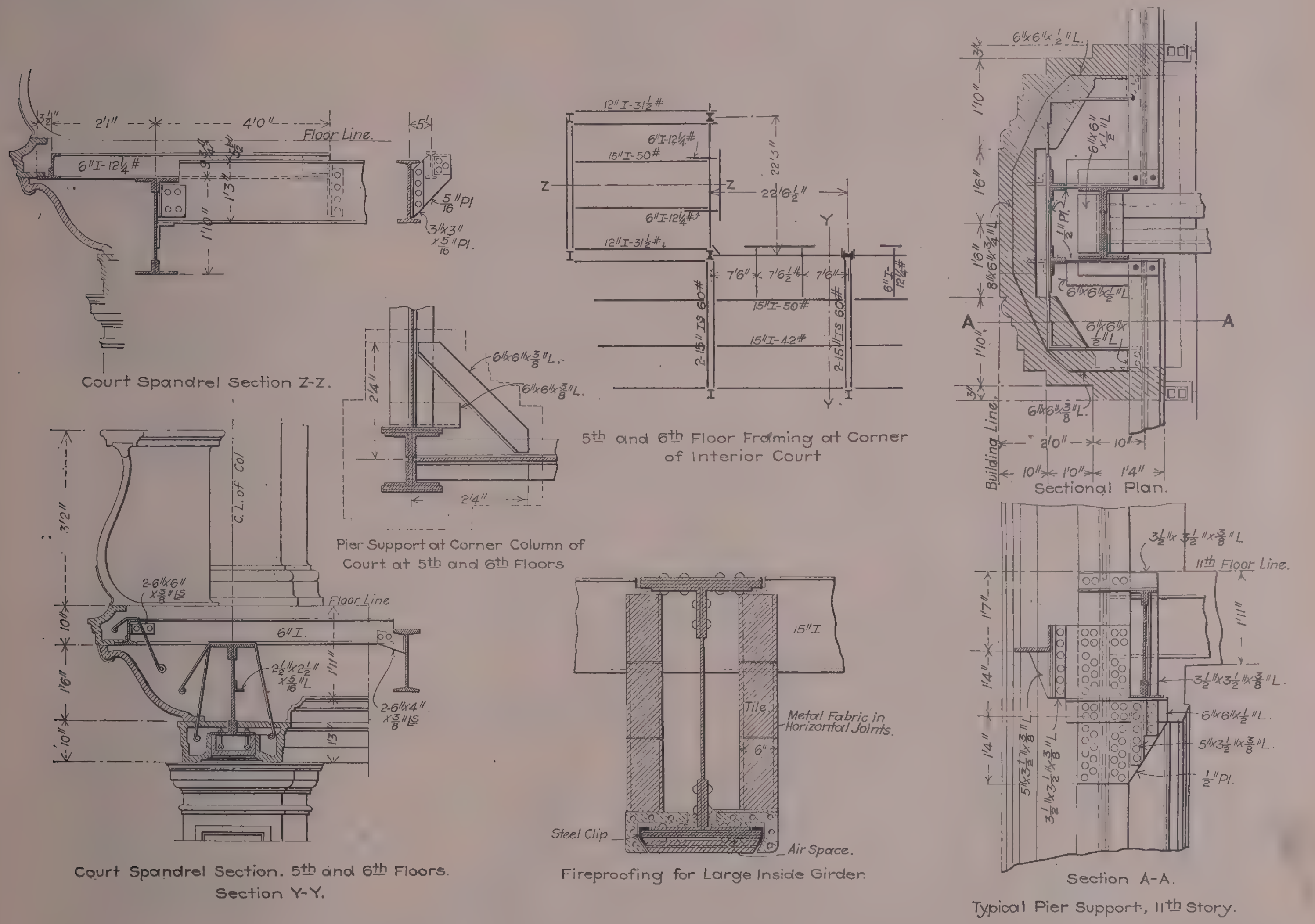
A number of columns project two short stories above the roof with minimum sections, to receive the frameworks of several rectangular pent houses for tanks, etc. These structures are very simply framed with I-beams and channels and have pitched roof trusses similar to those for the court skylight, but made with pairs of 3x3-in. chord angles and single 2½x2½-in. web angles. The roof tiles are laid on 2½x2½-in. T-bars about 16 in. apart, which are riveted across the top chord angles.

D. H. Burnham & Co., Chicago, are the architects of this building, Mr. J. G. Giaver structural engineer, and the Thompson-Starrett Co., Mr. George Simpson, chief engineer, general contractors. The structural steel is fabricated at the Pencoyd plant of the American Bridge Co., of New Jersey, Mr. Paul L. Wolfel, chief engineer, and is erected by the general contractor.

An Electric Track Machine.

An electric track machine which is used by the maintenance of way force of the Paris-Lyons-Mediterranean Ry. was illustrated in "Engineering" recently. It consists of a small boiler and 25-hp. generator set mounted to run on the rails or on the roads. It furnishes current to a portable two-wire transmission line about 0.6 mile long, run along the track where work is going on. When the men need the current they hang a pair of small trolleys on the two wires and carry the leads from these trolleys to the tools. Rails are fastened by screws on this line, and the machine for screwing them is operated electrically from this plant. Ballast tamping and rail drilling are done by other machines, also operated electrically.

SIDEWALK CONSTRUCTION in Ottawa is done by day labor, and Mr. C. H. Richardson, assistant city engineer, reports that the labor charges have been as follows: Excavation, 26 per cent. of the total; laying foundation, 12; mixing and laying concrete, 21; mixing and laying surface, 18; setting circular curbs and corners, 2; laying crossings, 6; foremen, 3; watchmen, 4; cartage, 8. The sidewalks have a 12-in. foundation of spalls placed by hand. On these is placed 3½ in. of 1:4:8 concrete made with 2-in. stone, and on this 1½ in. of 1:1:2 concrete, which is well troweled.



Court Spandrel Section Z-Z.

Pier Support at Corner Column of Court at 5th and 6th Floors

5th and 6th Floor Framing at Corner of Interior Court

Sectional Plan.

Court Spandrel Section. 5th and 6th Floors. Section Y-Y.

Fireproofing for Large Inside Girder.

Section A-A.

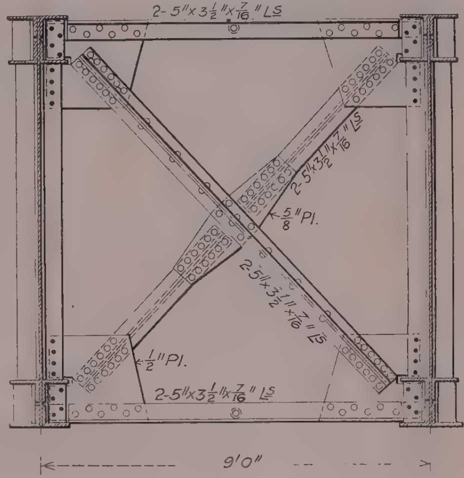
Typical Pier Support, 11th Story.

THE ENGINEERING RECORD

Details of the Steelwork in the New Wanamaker Building, Philadelphia.

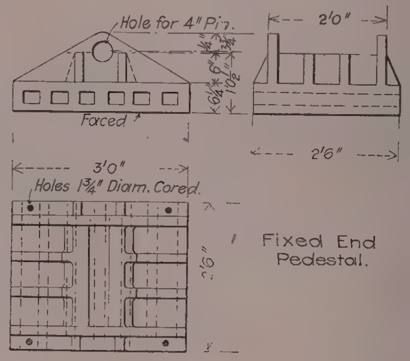
A Long Single-Track Plate-Girder Span.

Bridge No. 17 of the Mahoning Division of the Erie R. R. is a single track deck span with two plate girders 131 ft. 4 in. long, 9 ft. apart on centers and about 10 ft. deep over all in the center, which carry a track with a curvature of 3 degrees 30 minutes. The span is among the longest, if not the longest of any railroad plate girder in this country, but is exceeded by the double-track Piallee bridge of 170 ft. clear span on the Eastern Bengal R. R., which was described in The Engineering Record of June 2, 1894, and by the 213 ft. Mill street highway bridge at Cincinnati, described Sept. 28, 1901. This bridge crosses Yankee Run, near Hubbard, O., at a clear height of 12 ft. from base of rail to high water, and has a clear span of 125 ft. between abutments. The weight is approximately the same as that of a through truss bridge of equal length, but the plate girders were adopted because of the greater rigidity and capacity for unrestricted traffic, the impossibility of mischievous adjustments, the loss cost and trouble of maintenance and because plate girders were considered by the engineering department as the simplest and most reliable of steel bridge structures. It has also the advantage of being a deck structure, thus presenting no possible obstruction to suffer in case of derailment, whereas a lattice girder or truss would have required a depth that would have placed the track below the top chord level and thus left portions of the structure exposed to injury in case of a train accident on the bridge. The curve on the bridge makes a deck structure especially desirable.

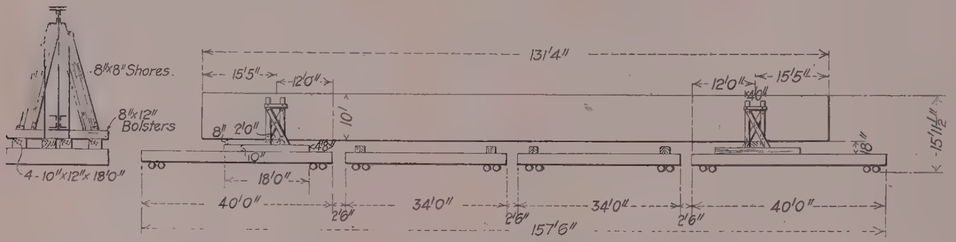


General Cross-Section.

THE ENGINEERING RECORD

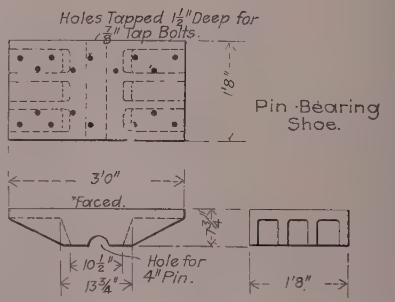


Fixed End Pedestal.

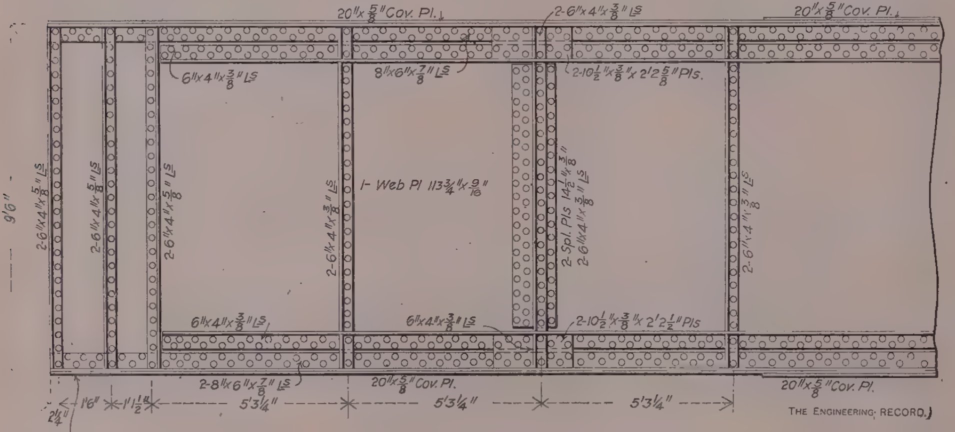


Girder Loaded for Shipment from Bridge Shops.

THE ENGINEERING RECORD

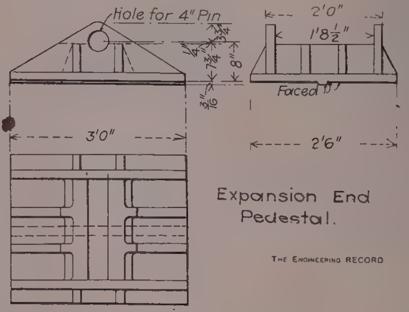


Pin-Bearing Shoe.



End Panels of 131′4″ Girder.

THE ENGINEERING RECORD.



Expansion End Pedestal.

THE ENGINEERING RECORD

End Bearings, Sway-Bracing and Method of Shipping Girders.

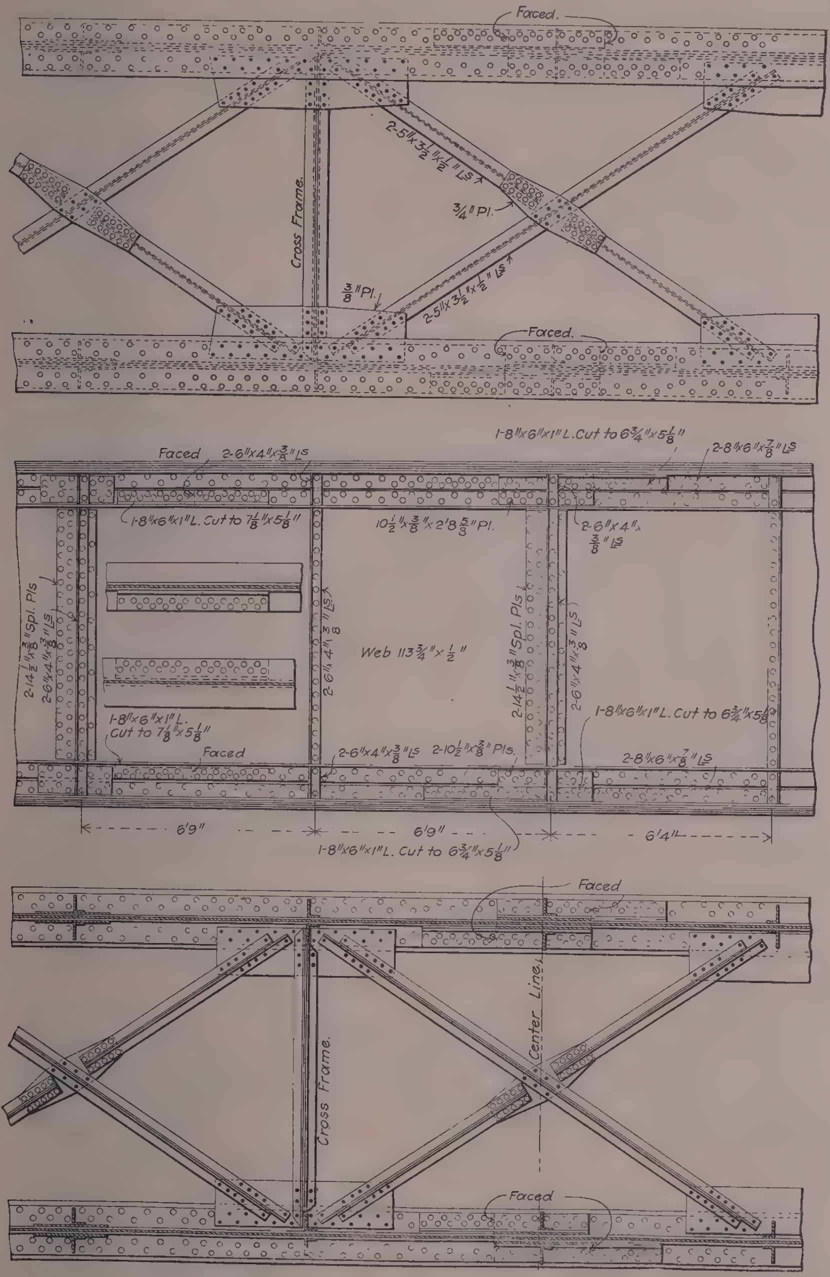
It is built throughout of soft steel containing not more than 0.08 of one per cent of phosphorus and having an ultimate strength of from 56,000 to 64,000 lb. per sq. in. and an elastic limit of not less than 58 per cent of the ultimate strength, an elongation of not less than 27 per cent and a reduction of area of not less than 45 per cent of test pieces.

The maximum working stress per square inch in either tension or compression is 8,000 lb. [1 + (minimum stress in member ÷ maximum stress in member.)] Shearing stress and bearing stress per square inch for rivets and bolts, respectively, 6,000 lb. and 12,000 lb. Shearing stress for web plates, 4,000 lb. Pressure on masonry, 250 lb. per square inch. Pressure per linear inch on rollers, 300 lb. x diameter. One-eighth of the web is considered effective flange section and the web plate is proportioned to resist all shearing stresses and is spliced both for shear and for bending moment stresses.

The girders are proportioned for the steel weight of the structure plus 400 lb. per linear foot for rails, ties and guard timbers, for a live load consisting of two coupled 247,000-lb. locomotives with 44 ft. wheel base followed by a train load of 4,000 lb. per linear foot, with axle spacing as shown in the diagram, for a longitudinal force at the rails of 2 per cent of the maximum live load, for a transverse force of 600 lb. per linear foot from wind pressure, and for variations of 150° F. in temperature. The girders were designed according to the standard specifications of the Erie R. R., and all steel more than ⅝-in. thick was drilled from the solid or sub-punched and reamed.

The girder web is made, in the center, of ½-in. plates abont 13½ ft. long, and at the ends of 9-16-in. plates about 12 ft. and 19 ft. long. The top flange is made ⅛-in. longer than the bottom flange in every 10 ft. to provide for the camber which amounts to about 1 in. at the center for the unloaded girder. In the end panels the web plate of the girder was assembled so that it would at first project slightly beyond the backs of the bottom flange angles and insure full bearing over the shoe after being chipped. Elsewhere the web plates are ordered ¼ in. scant of the back-to-back depth of the girder so as to clear the flange cover plates. All web splices are uniform and are made with four vertical rows of rivets in two 14½x⅜-in. cover plates extending only to the inner flange angles, and by four horizontal rows of rivets in a pair of 10½x⅜-in. plates between the inner and out flange angles which splice the points for flange stresses. Pairs of vertical web-stiffener angles at every splice and intermediate between each pair of splices, divided the web into panels 6 ft. 9 in. long in the center and intermediate parts and 5 ft. 3¼-in. long at the ends except over the bearings where there are three pairs of stiffeners close together to provide for the maximum end shear.

The flanges have H-shape cross sections and are duplicate top and bottom, each being made with four 6x8x⅞-in. angles in two pieces, and four 20x⅝-in. flange cover plates. The outside angles and the first cover plate extend to the end of the girder, the inside angles are about 6 ft. shorter, terminating about even with the shoes. The shortest cover plate is 64½ ft. long, its ends overlapping the ends of the pieces making up the long plate next to it so as to form its splices. The splices in the flange angles are all staggered, as shown in the elevation, and are arranged to come as near as possible to the center of the girder, being symmetrical about the center point, except as they are right and left handed. Each joint is made with a 6x8x1-in. cover angle 4 ft. 10 in. long with the back rounded to fit the fillet and the flange cut to 6¾ and 5⅛-in. The web stiffener angles are faced to bearing at both ends on the inner flange angles, and short angle of the same size are fitted between the flange angles at every panel to continue them across the full depth of the girder.



Center Panels and Splices of 131'4" Girder.

Details of Girder Construction and Bracing.

Cast steel shoes, 128 ft. 4 in. apart on centers, are secured to the bottom flanges with nine 1-in. tap bolts. The shoe has a massive transverse web about 6 in. wide acting like a pedestal with a full length half hole bearing for the 4-in. pin. The web has a ½-in. clearance with the coresponding pedestal web and is braced by three longitudinal webs, the outer two of which have full-hole bearings for the pin and are received in clearance slots provided in the pedestal web. The pedestal corresponds in general to the shoe, inverted, and is higher so as to provide for a larger base to distribute the load and reduce unit masonry pressure to the required limits. The outside webs have full pin holes, thus locking shoe and pedestal together, and clear the shoe webs. They are braced on the outsides by pairs of transverse webs. In both shoe and pedestal all webs except the center transverse one, are uniformly 1¼ in. thick. The shoes weigh 900 lb. each, the fixed end pedestals, which are seated directly on the cut stone masonry, weigh 2,125 lb. each. The expansion and shoes weigh 1,215 each, and have their bottoms planed with a center longitudinal guide strip engaging the nest of rollers on which it is seated. The rollers rest on riveted beds made with double plate, the lower one projecting beyond the longitudinal edges of the upper one to receive four short 1¼-in. stone bolts with wedges. The bed plates are designed to distribute the pressure uniformly on the masonry without developing stresses of more than 12,000 lb. per square inch.

The girders are connected by the top and bottom lateral systems and by ten sway-brace frames made, as shown in the general cross section, with pairs of angles back to back, riveted to large transverse vertical plates notched to clear the inner flange angles and field-riveted to the vertical web-stiffener angles at alternate panel points. Each panel between sway-brace frames has, in the planes of the top and bottom outside flange angles two panels of X-brace lateral diagonals, each made with a pair of angles back to back, field-riveted to horizontal connection plates field-riveted to the flange angles. In all cases the angles in one diagonal of each panel are continuous, and those of the other diagonal are cut to clear them at the intersection and spliced there by a flange plate shop-riveted to the short angles and field-riveted to the long angles, the different diagonals having their flanges turned in opposite directions so that the other flanges will be in the plane of the connection plate.

The girders were riveted up complete in the bridge shop and weigh about 113,700 lb. each. They were each loaded on four flat cars, arranged as shown in the diagram, with the two middle cars acting only as spacers. Each end of the girder was seated on a transverse sill with the center of the bearing 12 ft. from the end of the car. The sills were made with triple timbers seated on four longitudinal timbers, which distributed the load over a sufficient length of the car floor. Double steel plates were interposed between the sills and the longitudinals at bearings and were greased to allow the sills to revolve a few degrees horizontally about their center point when going around curves in the track. Both sills were secured to the car floor by vertical bolts through their center points, which are not shown in the diagram. At one end of the girder the bolt passed through a round hole and at the other through a slotted hole allowing for a few inches of longitudinal displacement. From the ends of the sills pairs of inclined braces were run to the under sides of the inner top flange angles of the girder and secured it firmly in the vertical plane. These pieces were X-braced and their upper ends were connected by horizontal timbers, notched into them and tied by long vertical screw rods with nuts at each end, which clamped them to the transverse sills. A pair of transverse bolster timbers were bolted over the center of each truck to the floor of each spacer car with clearance below the lower flange to the girder, thus keeping these cars free of the girder load, but providing stops to receive the girder in case of any accident and prevent it from falling more than a very few inches at worst.

The eight cars carrying the two girders were run as a special train from the bridge shops to the bridge site, the route being entirely over the tracks of the Erie Railroad Co. A representative of the bridge department accompanied the train and great care was taken in the transportation speed being reduced sometimes to four miles an hour to diminish the tendency to develop a considerable swaying movement. With these precautions the girders were safely transported around curves of 6 and 8 degrees in the main line and much sharper ones in the bridge shop yard.

At the site the girders were successively skidded from the cars on greased horizontal rails to cribbing built up alongside the 5-degree curved track to the height of the car floor and adjacent to one of the abutments. In this position, with its axis parallel to that of the finished bridge, the span was assembled with lateral and sway bracing riveted up complete and the cradles in which it had been transported were removed. The girders were moved from the cars to the cribbing by tackle operated by a pile driver hoisting engine.

Under the bottom flange of each girder were placed four horizontal transverse 7-in. channels 3 ft. long with the flanges up. Wooden cushion pieces were placed between the channel webs and the girder flanges and longitudinal angle clips were riveted to the backs of the webs to form guides engaging between them two rails in the plane of each girder. These rails sloped downward at a 4 per cent. grade across the river parallel to the old bridge and were supported on a trestle falsework. On them the span was moved by a hoisting engine and tackle until it was opposite its required position.

After the longitudinal movement of the span was completed the adjacent old span, which with the approach track had been raised 3 ft. to new grade, was displaced laterally on horizontal rails laid across temporary supports built at each end. On each abutment four lines of horizontal rails were laid transverse to the bridge axis and on them the new span was pulled into alignment a six-part tackle operated by the hoisting engine, which had been used for the longitudinal movement of the span. Traffic was immediately admitted to the bridge and afterwards it was lowered to bearing on the pedestals. The bridge was erected by the regular bridge force of the Mahoning Division of the Erie Railroad, and each span was moved transversely without difficulty in about ten minutes.

The girders were designed and their construction and erection was supervised by the engineering department of the Erie R. R., Mr. C. Buchholz, then chief engineer, and Mr. Mason R. Strong, bridge engineer. The total weight of the bridge is 299,930 lb., and it was built at the Elmira plant of the American Bridge Co.

Aims and Purposes of the Office of Public Roads, Department of Agriculture.

A paper read before the American Road Makers' Convention by A. N. Johnson, Highway Engineer, Office of Public Roads.

More than $50,000,000 are annually spent in maintaining our country roads. For years great sums of money have been raised by direct taxes from the people in all sections of the country to make so-called repairs to public highways. It is a matter of common knowledge that a large part of this money has been expended to little purpose and in but few and scattered localities is the improvement shown commensurate with the amounts expended. It is a conservative estimate to say that one-half of these heavy expenditures has been productive of no good results.

This condition has so long existed that it is evident there is something radically wrong in most communities with the methods of administration of road funds. It is, therefore, plain that the first thing to do towards the solution of improved highways is to improve the methods of road administration. To bring about such a change does not require more money from the taxpayer. Why, indeed, should a taxpayer feel inclined to support a measure calling for larger appropriations unless it has been shown that men skilled in the construction and maintenance of road systems have been selected for this important work. Let it first be proved that better results can be obtained with the money already raised and then discuss questions of larger expenditures.

It will therefore be seen that one of the most important features of the work conducted by the Office of Public Roads is to educate and train a number of young civil engineer graduates as highway engineers. In no other branch of constructive work are any such large sums of money expended without skilled supervision as in the construction and maintenance of our common roads. Scant attention has been given to this important branch of engineering by the engineering schools of the country, but the demand for trained men is yearly increasing, as shown by the frequent inquiries at this office for men capable of assuming charge of road systems in different communities. So few men, however, have been trained for this work that the number of experienced graduate engineers available is wholly inadequate.

The Office of Public Roads is at present offering to a limited number of young engineer graduates a special course in highway engineering. They are given opportunity to make personal inspection and reports on the methods of road construction and administration in the several States where this work has been systematized and put upon a practical basis. Opportunity is also given to make surveys and estimates of the actual cost of building roads under various local conditions, and practical experience is acquired in the actual construction of work under the direction of this office. Laboratory methods of testing various qualities of road materials are undertaken by these students, so that they become familiar with the purpose and value of the different physical properties belonging to these materials. This course is completed in one year, after which time those students who have shown themselves capable are given partial charge of independent pieces of work.

Another important feature of this department is to give practical advice and to superintend the construction of object-lesson roads in all parts of the country. It has been demonstrated repeatedly that while many communities desired better roads and were willing to pay for them, yet for lack of practical illustration they did not know what they wanted—or perhaps better—what the means and materials at their command were best capable of producing. Such communities upon formal application to the office of public roads are furnished the services of experts to demonstrate practically the best method of handling, under the conditions presented, the materials available. It is insisted that these men shall accomplish two things: The proper methods of construction, and second, an economic and business-like way of handling the work, so that the local authorities may be able to carry on successfully the improvements which have been indicated.

Another important end is also sought by these object-lesson roads: There are in most communities many persons who are skeptical as to how much better a well-constructed road will be than those with which they are acquainted. As a rule it needs, however, only the argument of visible results in a short piece of well-built road to make of the most skeptical the firmest advocates of scientific methods of construction.

Investigations and experiments in special forms of road building are also being made. A conspicuous example of these is the investigation of the method and effect of the application of petroleum oils and coal tars on various kinds of road surfaces. These experiments will be made in the District of Columbia through co-operation with the district commissioners, and also at Jackson, Tennessee. It is also probable that similar experimental work will be carried on at other places. While more inquiries are received concerning this special feature of road improvement than any other, it is at the same time a method of construction on which the least reliable data has been obtained. Practically no experiments have been systematically made and recorded.

In co-operation with the State Highway Commission of Illinois, it is expected to make experiments in burning the gumbo soil, with a view to producing a cheap method for making foundations. It is not believed that the burned gumbo will answer as a surfacing material to take the wear of heavy traffic, but that it may answer very well in the foundation of the road, on which can be placed a thin layer of hard surfacing material, thus greatly reducing the cost.

This office is also co-operating with other branches of the government in building roads on grounds exclusively under government control.

In addition to the actual study of the use of various materials in practical construction, a well-equipped laboratory is maintained for the purpose of studying and determining the physical properties of various road materials, so that they may be utilized in the most economic manner. Special tests for macadam materials have been devised. Such laboratories have been established in a number of universities throughout the country, largely through the initiative and encouragement of the Office of Public Roads.

Certain investigations originally undertaken with a view to determining the value of various materials in highway construction have led to most important results in other directions which may prove of great economic value to farmers throughout the country. Some of these investigations will be shortly published by Dr. A. S. Cushman, chemist in charge of the laboratory. This laboratory has also been entrusted with the investigation of materials which enter into the making of agricultural appliances and equipment; for example, a recent and most interesting discovery has been made as to the cause of the rapid deterioration of the modern wire fence.

A feature of the work of this department not to be undervalued is the study of road economics, in which statistics are being collected systematically from every county in the United States. These statistics when completed will show the mileage of improved and unimproved country roads, together with the amounts annually spent on their construction and maintenance, and will be of great economic value in formulating plans for general highway improvement in any given section. Some communities desire to spend more than they can afford, while it is true others are not spending what they should on highway improvement for their best development. While it is not the purpose of this office to instruct any community as to what they can afford, yet it is most important to collect and present such data as will enable different communities to decide intelligently for themselves the amounts they should expend for better roadways.

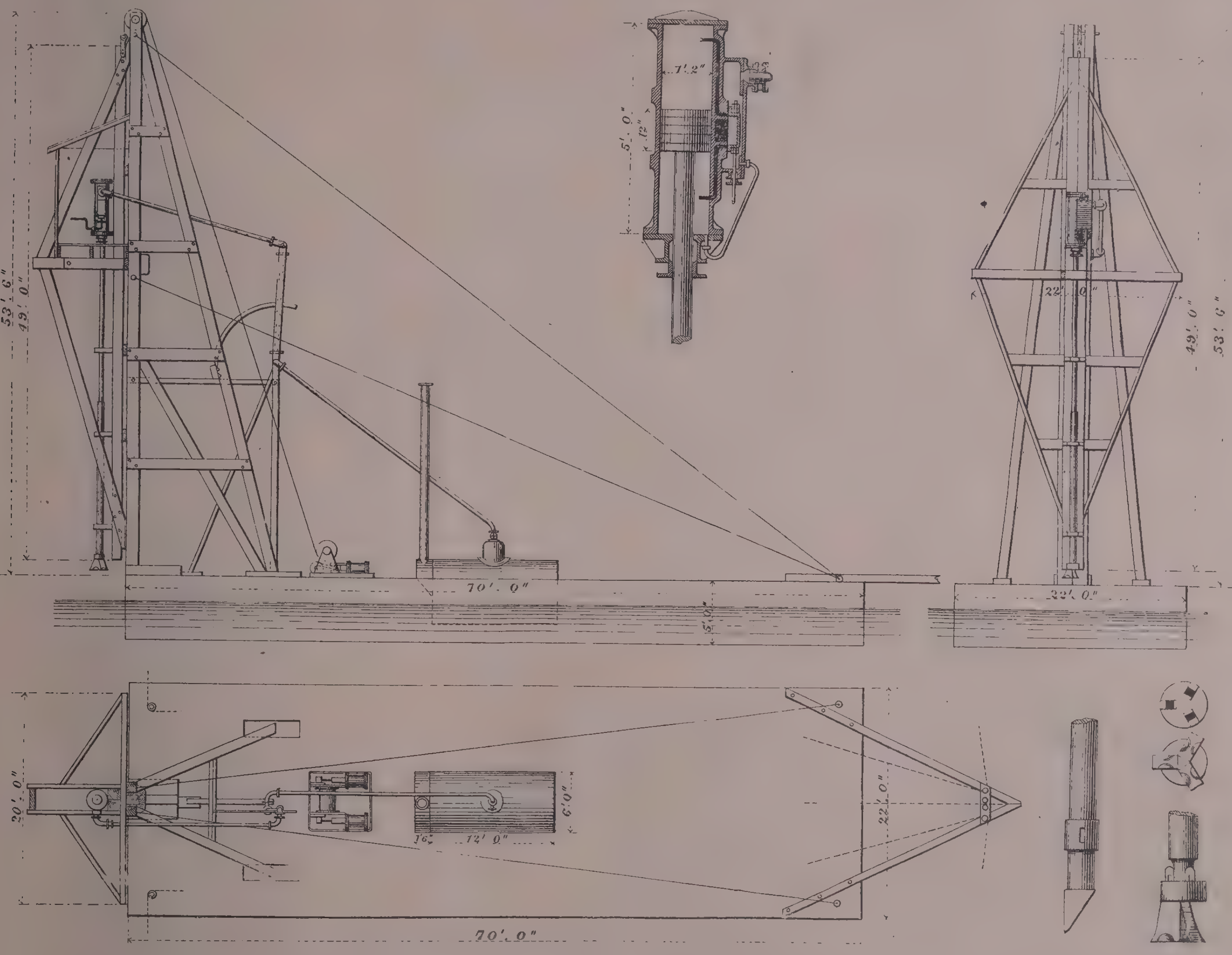
By an act of the last Congress the Office of Public Roads has been reorganized, with the result that its work is placed on a more systematic basis under the supervision of Mr. L. W. Page, appointed director July 1. As already outlined, the main features of the work will be educational, constructive, experimental and statistical. Each of these departments has been placed under the charge of some person whose knowledge and experience commend him to the particular character of his work Plans for the future contemplate closer co-operation with various departments of the government which now have or may have under their control the construction of roads. Particularly is it thought desirable that the construction and maintenance of the roads in the various forest reservations should be placed under the superintendence of this office.

In conclusion, it can be said that the general purpose of the Office of Public Roads is to collect and disseminate information that will aid those communities who wish to improve their public highways; to show not only the proper technical treatment that given conditions may require, but also an economic and business-like way of carrying on road administration; to emphasize the importance of successfully undertaking small improvements before engaging in the larger plans, and to suggest to the different communities methods at once adapted to their needs and to their pocketbooks.

A Reservoir Embankment at Manchester, N. H., which leaked considerably had a masonry inner wall backed with earth. Frost opened the joints, letting water into the earth. The seams were packed with jute and mortar and repointed with Portland cement, stopping all leakage.

A Submarine Rock Excavator.

A number of years ago Messrs. R. M. Scott and A. Goodsir, of Sydney, N. S. W., designed and built a drilling apparatus for the purpose of enabling them to carry on wharf-building and contracts involving operation on submarine rock, in a more expeditious manner and at a lower cost than with the rock-breaking apparatus and methods then known to them. Since that date the machine has been in continuous use in the harbor of Port Jackson, Sydney, for deepening various portions where a rock bottom exists, for drilling holes in rock for the reception of wharf piles, and for leveling rock for retaining wall foundations. The surface left by the machine is clean and regular, and the excavation may be finished to a level or an inclined bed as may be necessary. It was recently described in a paper by Mr. C. G. Hepburn published by the Institution of Civil Engineers, which is here republished, as affording an interesting comparison with American submarine drilling scows.



A Submarine Rock Excavator used in Australian Harbor Improvements.

The excavator consists primarily of a cutting or drilling tool connected directly to a piston reciprocating in a steam cylinder of considerable length, which is carried on a vertical slide or carrier, capable of vertical adjustment on a "tower" erected on a punt or other floating structure.

With a piston-rod of considerable weight reciprocating through a stroke of several feet, under the positive action of a piston acted on by steam, the work of breaking up large bodies of submerged rock is very speedily accomplished. For example, when the moving parts weigh about 3½ tons and the stroke of the piston is about 4 ft., it has been found that, making 60 strokes per minute, this apparatus will break more than 30 cu. yd. of hard submerged sandstone rock per day. The debris may be removed by dredging, or it may be found convenient to pulverize it in situ by means of a hammer-head substituted for the chisel or cutter, and to raise the reduced material by means of a sand-pump.

The tower erected on the punt consists of two vertical timbers, each 12 in. square in cross-section, set 1 ft. apart and braced with diagonal struts and steel wire guys. The carrier, which slides vertically upon the face of the tower, and which has its movement controlled by a steam-winch, is formed of two vertical timbers, each 12 in. square in cross-section, and a framing of 12 x 6-in. timbers bolted together so as to provide a rigid structure. The carrier is secured from transverse movement on the tower by a T-shaped guide or retaining piece bolted to its vertical timbers and sliding between the two upright timbers of the tower. The flanged head of the T-piece bears against the rear of these timbers, to prevent the carrier from surging outwards. The carrier is provided with a shelter for the steam cylinder and the operator. The cylinder, which is 14 in. in diameter and 5 ft. in length, is bolted securely to the carrier. The piston-rod is 6 in. in diameter at its top end, increasing to 7½ in. in diameter at the lower end, and is guided by three bearings. The tool or chisel used for excavation or drilling is secured to the end of the piston-rod by means of a cotter. The tools used vary with the particular class of work to be done. The drill-head is formed of three drills forged from a steel bar 6 x 4-in. in cross-section. The outer end of each drill is forged out to provide clearance by swaging both sides of its lower end.

Steam is conveyed from the boiler to the cylinder by means of a 4-in. steam pipe, trunnioned at the joints to permit of vertical movement. One of the pipe lengths is guided by a quadrant piece and is reinforced by timber bolted to the pipe, which bears against the quadrant.

The punt having been moored above the site to be operated upon, the sliding carrier is lowered until the tool on the end of the piston-rod has touched the rock bottom and the piston is just above the lower port of the cylinder. The slide-valve is operated by hand, similarly to that of a steam hammer. As the drill sinks into the rock, the carrier is constantly lowered during the operation of drilling, so that the full stroke may be obtained, until the hole has been sunk to the requisite depth. To obviate the danger of the piston striking the bottom of the cylinder with sufficient force to cause injury to the cover, a supplementary steam pipe, taking its supply from the valve-casing, is led into the bottom of the cylinder. This arrangement insures a constant supply of steam at boiler pressure on the lower side of the piston, acting on it as a brake or buffer on its descent, the piston driving the steam back through the pipe into the valve-casing. A further precaution, to prevent accident, is taken by forming the steam ports in the cylinder at some distance from the end, thereby allowing the piston to shut off the exhaust at a point where the imprisoned steam can also co-act as a buffer.

In everyday practice it has been found that with careful handling of the valve these safeguards are sufficient to obviate any damage to the cylinder.

Messrs. Scott and Goodsir report that although the apparatus has now been in constant use for a period of six years, no renewals of the cylinder, cylinder-covers, piston-rod or steam pipes have been necessary, the apparatus as installed in the first instance being still in perfect working order. The first contract upon which this rock-breaker was employed was that of deepening the harbor at the Sydney Harbor Colliery wharf, at Balmain. During the several months in which it was at work on this, on an average 30 cu. yd. of rock were removed per day. This work, which extended over a large uneven area, was finished to a level bottom. The apparatus has also done a very large amount of work in rock-boring for wharf piles. Its speed naturally depends upon the hardness of the rock upon which it is operating; in dealing with hard freestone, a hole 18 in. in diameter and 5 ft. in depth can be drilled in less than 10 minutes. In softer rock the speed is considerably greater. A necessary adjunct to the submarine rock-breaker is a force-pump, fitted with a hydraulic hose and nozzle, to scour the debris from the drilled holes.

The Determination of Physical Values.

By Clinton S. Burns, M. Am. Soc. C. E.

It is frequently asserted that mathematical precision is unnecessary when dealing with subjects founded upon approximate assumptions, and that it is unbusinesslike to spend time in securing a result of greater refinement than the premises in the case. However, this is not strictly true in estimating present values of property, for he who may be called upon to make expert valuations must remember that the accuracy of his opinions must be subject to criticism by other experts, and he who knows his subject best and can give precise results in cross-examination, together with reasons for his methods, makes the most valuable witness. Research has revealed the fact that many of the published data on the subject of valuations are at variance, due largely to the dissimilar views held by the various writers.

All are agreed that an essential prerequisite in arriving at the value of an article is to determine, as nearly as possible, the length of its life of service. Having settled upon the proper period of life, it should then be a matter of simple mathematical calculation to determine the depreciation and present value of the article in question. The usual custom, so far as can be ascertained from the published data available, has been to assume a proper rate of interest, compute the fund necessary to be set aside each year for a renewal fund, such that these annual contributions, when invested at compound interest until the end of the life of the article will then amount to a sum equal to the cost of duplication, find the total amount of the renewal fund at the date of valuation, and assume this to represent the depreciation from which the present physical value is determined by subtracting this depreciation from the cost of duplication.

It is desired to present in this paper an entirely different method, which it is believed is founded upon correct economics. It is based upon the method of equal annual costs and assumes that any purchaser should give an amount for a second-hand article such that its annual cost is exactly equal to the annual cost of a new article capable of serving the same purpose. In case the purchaser be a municipality, it certainly seems just and equitable to adopt the year as the unit of time upon which to base comparative estimates, for taxes are levied and collected annually, and each individual taxpayer is affected by the investments made by the municipality in direct proportion to the annual cost, and little, if at all, does it matter to him whether the first cost of a machine to be used in public service be much or little, as long as his yearly taxes are kept at a minimum. It is therefore evident that the purchaser can afford to pay as much annually for an old machine or other article as for a new one to serve the same purpose, while on the other hand there can be no reason why more than this amount should be paid. This applies to the physical value considered from the utilitarian point of view only, and does not take into consideration any value that may accrue from aesthetic features, "going value" or other special conditions.

If the transaction be between individuals or corporations, the same arguments apply as when one of the contracting parties is a municipality.

A formula for expressing the present value of any property in accordance with the above theory may be deduced as follows: Let p be the cost of duplication, in dollars; n the length of life of the new article in years; s the annual contribution to a renewal fund in order that there may be accumulated a fund equal to p at the end of n years; r the rate of interest at which renewal funds are invested at the beginning of each year; R the rate of interest required to be paid on borrowed capital; m the number of years article has been in service; x the value of the article after m years of service; and s' the annual contribution to a renewal fund in order that there may be accumulated a fund equal to x at the end of the life of the article having been in service for m years. Then from the familiar expression for the value of an annuity,

$$s = pr \div [(1+r)^{n+1} - (1+r)] \quad \ldots\ldots(1)$$

and likewise,

$$s' = xr \div [(1+r)^{n-m+1} - (1+r)] \quad \ldots(2)$$

Now among the items composing the annual cost, are the renewal fund and the interest on the investment. Hence, for a new article the annual assessment to cover these items is

$$pR + s \quad \ldots\ldots\ldots\ldots(3)$$

and for an article having been in service for m years, the annual assessment for these items is

$$xR + s' \quad \ldots\ldots\ldots\ldots(4)$$

Therefore, upon the theory that the price to be paid for a second-hand article should be such that the annual cost of accomplishing a definite amount of work with it should be the same as though a new article were purchased and used for the same work, it follows that

$$pR + s = xR + s' + c \quad \ldots\ldots\ldots(5)$$

where c is the increased annual cost of operation and maintenance due to the loss of efficiency of the older article; substituting for s and s' their values in equation (1) and (2) respectively, gives:

$$pR + \frac{pr}{(1+r)^{n+1} - (1+r)} = xR + \frac{xr}{(1+r)^{n-m+1} - (1+r)} + c \quad (6)$$

from which

$$X = \frac{p\left[R + \dfrac{r}{(1+r)^{n+1} - (1+r)}\right] - c}{R + \dfrac{r}{(1+r)^{n-m+1} - (1+r)}} \quad \ldots\ldots\ldots(7)$$

This equation has a less formidable appearance when concisely stated in words as follows: Present value of old article equals the sum of the interest and renewal fund for new article diminished by the annual loss due to decreased efficiency of old article, divided by the sum of the interest and renewal fund on one dollar for the term of years that the old article has yet to serve.

The value of $r \div [(1+r)^{n+1} - (1+r)]$ and of $r \div [(1+r)^{n-m+1} - (1+r)]$ may be taken directly from annuity tables, thus reducing equation (6) to the form of a simple proportion.

The value of $r \div [(1+r)^{n+1} - (1+r)]$ is given in the table for each integral value of n from 1 to 100 inclusive, for r = 2, 2½, 3 and 3½ per cent.

VALUES OF $r \div [(1+r)_{n+1} - (1+r)]$

n	2%	2½%	3%	3½%
1	0.9804	0.9766	0.9709	0.9668
2	0.4853	0.4817	0.4785	0.4749
3	0.3204	0.3173	0.3141	0.3111
4	0.2379	0.2350	0.2320	0.2292
5	0.1884	0.1856	0.1829	0.1801
6	0.1554	0.1527	0.1501	0.1475
7	0.1319	0.1293	0.1267	0.1242
8	0.1142	0.1117	0.1092	0.1067
9	0.1005	0.0980	0.0956	0.0932
10	0.0895	0.0871	0.0847	0.0824
11	0.0805	0.0781	0.0758	0.0735
12	0.0731	0.0707	0.0684	0.0662
13	0.0668	0.0644	0.0622	0.0600
14	0.0614	0.0591	0.0568	0.0547
15	0.0567	0.0544	0.0522	0.0501
16	0.0526	0.0503	0.0482	0.0461
17	0.0490	0.0468	0.0446	0.0425
18	0.0458	0.0436	0.0415	0.0394
19	0.0429	0.0407	0.0387	0.0367
20	0.0403	0.0382	0.0361	0.0342
21	0.0380	0.0359	0.0339	0.0319
22	0.0359	0.0338	0.0318	0.0299
23	0.0340	0.0319	0.0299	0.0280
24	0.0322	0.0302	0.0282	0.0263
25	0.0305	0.0286	0.0266	0.0248
26	0.0291	0.0271	0.0252	0.0234
27	0.0277	0.0257	0.0238	0.0221
28	0.0265	0.0244	0.0226	0.0209
29	0.0253	0.0233	0.0215	0.0198
30	0.0242	0.0222	0.0204	0.0187
31	0.0231	0.0212	0.0194	0.0177
32	0.0222	0.0203	0.0185	0.0168
33	0.0213	0.0194	0.0176	0.0160
34	0.0204	0.0186	0.0168	0.0152
35	0.0196	0.0178	0.0161	0.0145
36	0.0188	0.0170	0.0153	0.0138
37	0.0181	0.0163	0.0147	0.0131
38	0.0175	0.0157	0.0140	0.0125
39	0.0168	0.0150	0.0134	0.0120
40	0.0162	0.0144	0.0129	0.0114
41	0.0157	0.0139	0.0123	0.0109
42	0.0151	0.0134	0.0118	0.0104
43	0.0146	0.0128	0.0114	0.0100
44	0.0141	0.0124	0.0109	0.0095
45	0.0136	0.0120	0.0105	0.0091
46	0.0132	0.0115	0.0101	0.0087
47	0.0128	0.0111	0.0097	0.0084
48	0.0124	0.0107	0.0093	0.0080
49	0.0120	0.0104	0.0089	0.0077
50	0.0116	0.0100	0.0086	0.0074
51	0.0112	0.0097	0.0083	0.0071
52	0.0109	0.0093	0.0080	0.0068
53	0.0106	0.0090	0.0077	0.0065
54	0.0103	0.0087	0.0074	0.0063
55	0.0099	0.0084	0.0071	0.0060
56	0.0097	0.0081	0.0069	0.0058
57	0.0094	0.0079	0.0066	0.0055
58	0.0091	0.0077	0.0064	0.0053
59	0.0088	0.0074	0.0062	0.0051
60	0.0086	0.0072	0.0059	0.0049
61	0.0084	0.0069	0.0057	0.0047
62	0.0081	0.0067	0.0055	0.0045
63	0.0079	0.0065	0.0053	0.0044
64	0.0077	0.0063	0.0052	0.0042
65	0.0075	0.0061	0.0050	0.0040
66	0.0073	0.0059	0.0048	0.0039
67	0.0071	0.0058	0.0047	0.0037
68	0.0069	0.0056	0.0045	0.0036
69	0.0067	0.0054	0.0044	0.0035
70	0.0065	0.0053	0.0042	0.0033
71	0.0064	0.0051	0.0040	0.0032
72	0.0062	0.0050	0.0039	0.0031
73	0.0061	0.0048	0.0038	0.0030
74	0.0059	0.0047	0.0037	0.0029
75	0.0057	0.0045	0.0036	0.0028
76	0.0056	0.0044	0.0034	0.0027
77	0.0055	0.0043	0.0033	0.0026
78	0.0053	0.0042	0.0032	0.0025
79	0.0052	0.0040	0.0031	0.0024
80	0.0051	0.0039	0.0030	0.0023
81	0.0049	0.0038	0.0029	0.0022
82	0.0048	0.0037	0.0028	0.0021
83	0.0047	0.0036	0.0027	0.0021
84	0.0046	0.0035	0.0027	0.0020
85	0.0045	0.0034	0.0026	0.0019
86	0.0044	0.0033	0.0025	0.0019
87	0.0043	0.0032	0.0024	0.0018
88	0.0042	0.0031	0.0023	0.0017
89	0.0041	0.0030	0.0023	0.0017
90	0.0040	0.0030	0.0022	0.0016
91	0.0039	0.0029	0.0021	0.0016
92	0.0038	0.0028	0.0020	0.0015
93	0.0037	0.0027	0.0020	0.0014
94	0.0036	0.0027	0.0019	0.0014
95	0.0035	0.0026	0.0019	0.0014
96	0.0035	0.0025	0.0018	0.0013
87	0.0034	0.0024	0.0018	0.0013
98	0.0033	0.0024	0.0017	0.0012
99	0.0032	0.0023	0.0016	0.0012
100	0.0031	0.0023	0.0016	0.0011

It is interesting to observe how the present value of an article is affected by its cost of operation and maintenance.

In equation (5) c is defined as the increased annual cost of operation and maintenance due to the loss of efficiency of the article whose present value is sought. However, if a part of the inefficiency is due to temporary or remediable deterioration, this fact should be taken advantage of by first calculating the cost of bringing the article to its maximum economic efficiency, and using the value of c, corresponding to this condition, in which case the value of x, thus determined from equation (7) will be greater than the present value of the article by the amount required to correct the temporary defect.

That is, if, by spending Q dollars to repair temporary defects, the efficiency of an article can be so improved that the annual cost of operation and maintenance to accomplish certain work will exceed that of a new article by c' instead of c, then denoting its value after improvement by x' it follows that

$$x' = \frac{p\left[R + \dfrac{r}{(1+r)^{n+1} - (1+r)}\right] - c'}{R + \dfrac{r}{(1+r)^{n-m+1} - (1+r)}} - Q \quad \ldots .(8)$$

Subtracting equation (7) from equation (8) gives,

$$\frac{c - c'}{R + \dfrac{r}{(1+r)^{n-m+1} - (1+r)}} - Q = x' - x \quad (9)$$

increase in value, due to the proposed improvement.

Remembering now that $c - c'$ represents the annual saving due to the investment Q, it follows that no contemplated improvement to an old plant possesses any economic value unless its cost be less than the quotient obtained by dividing the annual saving due to the proposed improvement, by the rate of interest plus the renewal fund for one dollar for the period the plant has yet to serve.

In the application of the foregoing equations, it is of prime importance that the proper values be assigned to the various factors. The cost of duplication, p, can be determined with accuracy in nearly every instance. The length of life, n, that a new article may be expected to serve, can be predicted with reasonable accuracy for all structures whose kind has been in service under varying conditions for a sufficient number of years to establish their durability. The renewal fund, s, is susceptible of accurate mathematical calculation when p and n are known, or s may be taken directly from tables, if any be accessible with the proper arguments. The rate of interest, r, at which renewal funds can be invested at the beginning of each year can be determined by inquiring of banks, trust companies, or other financial institutions of known reliability. The rate of interest, R, required to be paid on borrowed capital is likewise easily ascertainable by inquiry.

It will seldom occur that R and r are equal, because the rate of interest that can be obtained upon a relatively small fund, invested at the beginning of each year, is usually much less than the rate required to be paid on a large loan extending over a long term of years, for any financial institution entering into contract to act as custodian for a renewal fund and guaranteeing to pay interest on each annual increment added to the fund, must necessarily calculate on some loss of time in securing a favorable investment of the funds, and must also make the rate low enough to cover insurance against a possibility of losing an occasional investment through declining securities. On the other hand, a financial institution making a loan for construction work must receive a sufficient rate of interest to provide against such items as legal expenses occasioned by bad faith on the part of the borrower and possibly decline in the value of the security due to improperly constructed or poorly managed works. It is therefore natural to expect considerable disparity between r and R.

For present Western conditions, r ranges from 2 per cent. to 3 per cent., while R varies from 4 per cent. to 6 per cent., depending upon the nature of the securities and the magnitude of the loan. In some cases, however, renewal funds can be reinvested in extensions or improvements so as to secure greater returns that can be obtained from outside investment. This is particularly true in case of a water works system or lighting plant, located in a rapidly growing community.

The number of years, m, that an article has been in service is usually a matter of record, which determines the length of service that may yet be expected of it, namely, n-m.

Knowing the value of n-m, the value of s' is then taken from tables, or computed per unit of value, the same as indicated above for s.

The loss of efficiency, c, due to deterioration is usually closely calculated, since the actual cost of operating the old plant is a matter of record, or can be determined by experiment, and the cost of operating its fac simile, new, can be inferred by comparison with others.

From equation (7) it is seen that if the numerator equals zero then the article in question has no economic value whatever, and if it be negative, then the article is operating under conditions which should either relegate it to the junk pile, or else have it examined for possible improvement.

There are without doubt many plants in operation throughout the country capable of being greatly enhanced in economic value by carefully planned reconstruction. The improvements that can be economically made in any particular case are usually limited within definite lines, and the saving in cost of operation that may be expected from each proposed improvement can be estimated and used as a basis of comparison in applying equation (9) as a criterion to determine whether or not the proposed improvements are worthy of installation.

In many instances, the cost of operation is unaffected by the age of the structure, in which case $c = o$ in equation (5), and for this class of structures equation (7) may be written in the form,

$$\frac{x}{p} = \frac{R + \dfrac{r}{(1+r)^{n+1} - (1+r)}}{R + \dfrac{r}{(1+r)^{n-m+1} - (1+r)}} \quad \ldots\ldots .(10)$$

Then for p = unity, the value of x is readily calculated with a slide rule in conjunction with annuity tables, the value of the article being read directly from the slide rule in terms of percentage of value of new article. In this way a set of diagrams may be constructed with r, R, n. m. and x as arguments covering the usual values of these factors. These diagrams are found to afford convenient means for rapid approximate calculations, and for checking results of all problems within their scope.

Examples.—To find the present value of a standpipe 18 years old, the cost of duplication being $15,000. Money can be borrowed at 5 per cent. for the erection of a new structure, and renewal funds can be invested at the beginning of each year at 2½ per cent. The standpipe is properly located and correctly proportioned, so that the cost of operating the system is not increased on account of the age of the structure. After careful consideration of all local conditions, it is determined that the life of a new structure would be thirty years.

From the table the renewal fund for a structure having thirty years to serve, is 0.0222 per unit cost, while for the structure eighteen years old, having only twelve years yet to serve, the renewal fund is .0707 per unit of cost. Hence, from formula (7), remembering that $c = 0$, $x = 15000\ (.05 + .0222) \div (0.05 + 0.0707) =$ $8,972.66, present value of standpipe. If greater precision be required, the value of the renewal fund may be calculated from the formula instead of taken from the table.

Again, to find the present value of a pumping engine twenty years old, the cost of duplication being $10,000. Rate of interest 5 per cent. on borrowed capital and 2½ per cent. on renewal fund investments. A new pump of similar construction is estimated to have a life of thirty years, but the old one is worn so that the annual cost of operation is $550 greater than it would be for a new pump, but by reboring the cylinders and making other repairs amounting to $3,000, the annual cost of operation can be reduced to within $50 of that of a new plant.

Then applying the criterion stated in equation (9) gives $646.97, thereby showing that the contemplated repairs will add to the economic value of the plant, the sum of $646.97. Equation (7) therefore gives the present value, $1,254.56, and since the plant is capable of betterments that will add $646.97 to its economic value, its commercial value should therefore be $1,901.53.

These two examples suffice to illustrate the application of the above principles to two general classes of structures encountered in ordinary valuation work, viz., first, structures of constant efficiency whose depreciation comes from age alone; and second, structures whose efficiency varies with age, such that their depreciation in value is due not only to the shortening term of service, but also to an increasing consumption of energy in the performance of constant work.

It is perhaps needless to state in conclusion that while it is believed that a judicious application of the formulas presented in this paper will be a material aid in solving many problems that arise in the determination of valuations, yet no formula should be used without extreme caution, tempered with judgment as to its applicability to the case under consideration.

Pollution of Rivers by Sewage.

Pollution of rivers by sewage has been before the courts of New Jersey so many times that the legal penalties for such contamination have at last been definitely settled. The law seems to be summed up admirably in the decision of the court of errors and appeals in Doremus v. City of Paterson, 61 Atl. Rep. 396. This decision states that the owners of non-tidal riparian lands are entitled to an injunction restraining a riparian city above them from polluting the stream with its sewage. Nevertheless, as such an injunction would, in cases like that of Paterson, which has an extensive sewerage system, destroy very largely the value of the sewers and be a menace to health, it would be inequitable if relief could be afforded otherwise. Consequently, the courts will not grant such an injunction if the city will compensate the riparian owners for the injury inflicted by the pollution. This is theoretically very nice, but the appraisal of the amount of damage will be troublesome. Some inventor will have to get up a small chart, used like a smoke chart, or a mechanical nose that will indicate the degree of offense by the angle at which it will become turned up by the odors from the river.

The Peat Briquettes made by Dr. C. D. Jenkins at East Lexington, Mass., have now been under test for some time on switch and local engines of the Boston & Maine R. R. The fuel costs less than coal and makes a very hot fire with little smoke, but its actual suitability for locomotives seems to be undetermined as yet. The briquettes are made at a plant which is mainly experimental, for Dr. Jenkins is endeavoring to ascertain all the facts about the manufacture and use of this fuel before giving publicity to his work.

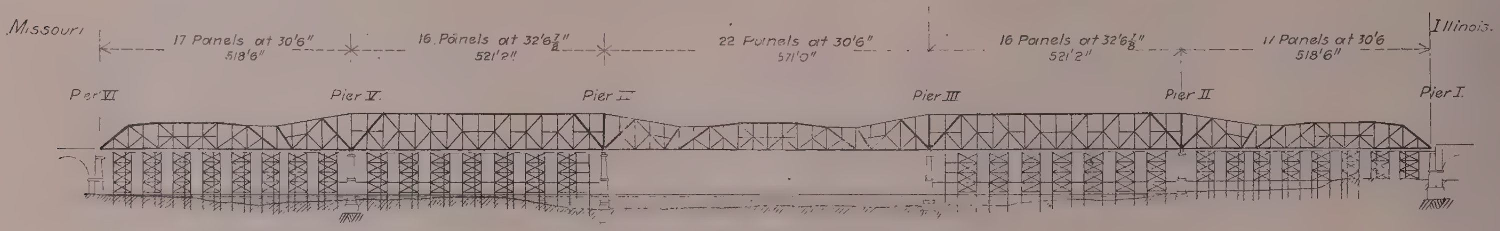
The Erection of the Thebes Bridge Superstructure.

The double-track railroad bridge built over the Mississippi River at Thebes, Ill., at a cost of $2,800,000, crosses the channel with a 13,477-ton steel superstructure 2,750 ft. long and 65 ft. in the clear above high water. This is symmetrical about the center point, each half consisting of a 521½-ft. intermediate span with its trusses cantilevering 152½ ft. beyond each pier to support the ends of the shore and suspended center spans, respectively. The trusses are continuous from shore to shore, are 32 ft. apart and from 50 to 75 ft. deep on centers. They have fixed bearings on Piers I, II, V and VI and expansion bearings on the center piers III and IV. The spans have a maximum weight of 11,650 lb. per linear foot, and all the truss members are connected with pins from 10 to 18 in. in diameter, with clearances of 1/32 in. All other connections are riveted. All members have riveted sections except the tension diagonals, the center panels of bottom chord in the suspended span and the top chords of the cantilever arms, which are eyebars up to 14x2½ in. The four-web stiff top chords are 63¾ in. wide and 42 in. deep, the floor beams are 78 in. deep, and other members are in proportion, so it can readily be seen that the erection involved assembling very large and rigid pieces with extreme accuracy. The details of the design have already been described in The Engineering Record of Nov. 12 and Dec. 24, 1904, and July 22, 1905.

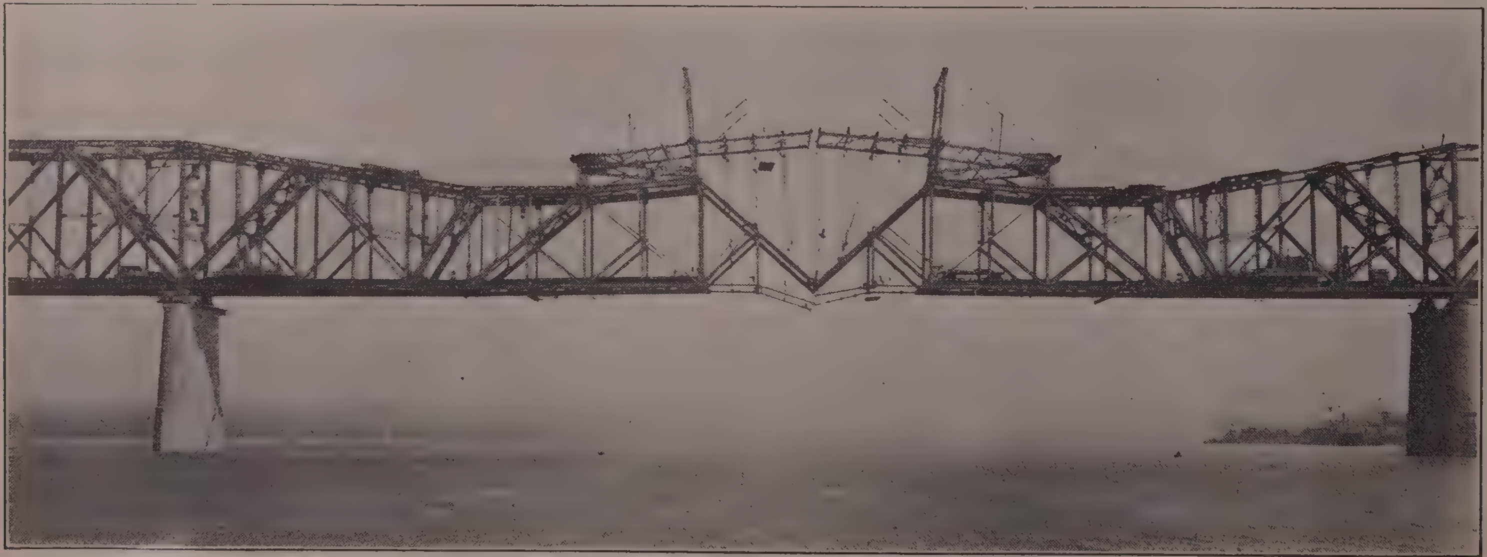
All of the superstructure except the 671-ft. center span was erected on pile falsework by an ordinary three-bent wooden gantry traveler. The falsework was built with independent three-bent towers under alternate panels of the superstructure. The rock bottom of the river is covered with boulders and in some places with sand. The maximum depth of the water was about 35 ft. at low water.

Piles had a maximum penetration of 8 ft. except where they entered crevices, where their penetration varied from 15 to 30 ft. Very little

View from Top Chord of Suspended Erection Platform at End of Cantilever.



Elevation of Steel Superstructure and Falsework.



Center Panels Connection; Assembling L 56.

Lower Chord Temporary Erection Adjustment.

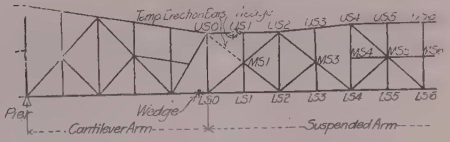
difficulty was encountered with the piles for Span I, but for Span II the bottom was so irregular that it was necessary to drive extra reinforcement piles. On the Illinois side the piles were delivered by a standard-gauge track on the downstream side of the bridge; on the Missouri side they were floated to the pile driver. The piles were of oak, cypress and gum, 10 in. diameter at the point and 46 to 75 ft. long, spliced to 86 ft. in some cases. While being driven they were spaced and held in position by a barge. On the Illinois side the piles around Pier II were driven by a floating pile driver, and the remainder as far as Pier III were driven by a special overhead machine.

On the Missouri side the floating driver was used from the shore to Pier IV and between Piers V and VI. The remaining piles were driven by the special driver, which consisted virtually of a 32x32-ft. horizontal timber platform carrying two stiff-leg derricks with hammer leads suspended from each. The double 9x18-in. longitudinal sills were framed to the feet of the 12 by 12 in. by 30 ft. masts, and leads about 40 ft. long were pivoted to the points of the 12 by 12 in. by 50 ft. booms. Each hammer weighed 2,400 lb. and was operated by a double-drum hoisting engine on the rear of the platform, the second drum being used for the derrick boom topping-lift tackle. The traveler sills were not provided with wheels, but were skidded on longitudinal timbers across the pile caps about 20 ft. above low-water level. Piles were handled by lines operated by the engine spools, which also swung the booms with pairs of light tackles attached to them at the center and to the middle and projecting ends of the front transverse brace at the feet of the masts.

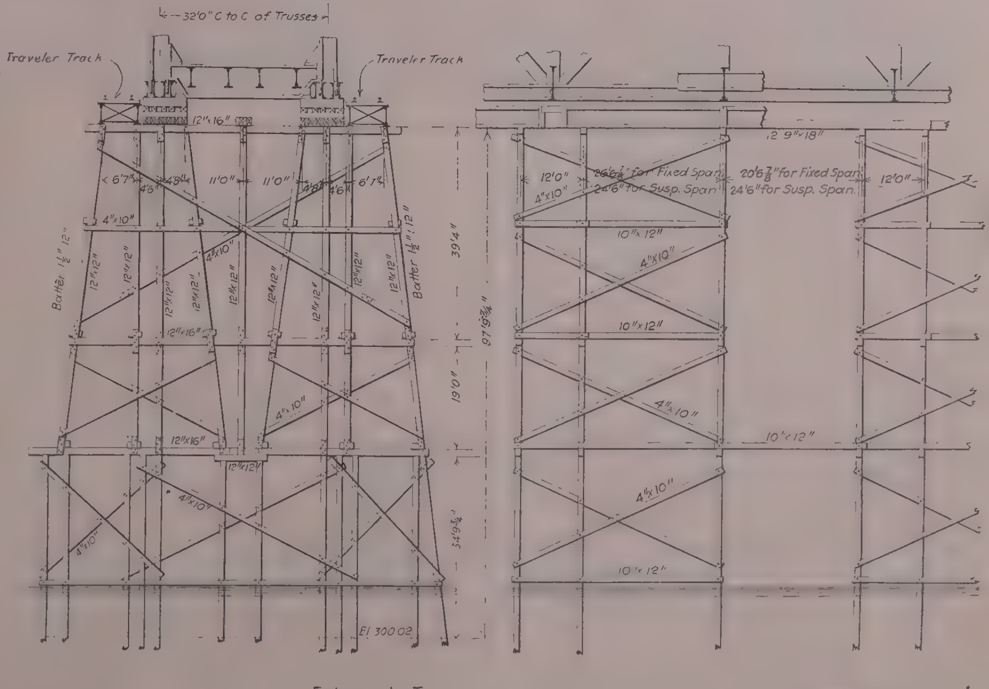
The falsework on top of the pile bents was 63 ft. high. It was made in three stories, with the 12x12-in. vertical and inclined posts in one length for the upper two stories and secured to the horizontal caps and sills by pairs of 4x12-in. wooden scabs, 4 ft. 6 in. long. The upper and lower stories of each bent were successively assembled in a horizontal position on top of the pile caps and set in position by a derrick traveler on top of the finished falsework. This derrick traveler corresponded to the pile-driver traveler except that the suspended hammer leads were omitted.

The falsework bents were arranged in pairs under the main panel points and singly under the subpanel points, and were X-braced with 4x10-in. pieces bolted with ⅞-in. bolts in every longitudinal and transverse panel. Four lines of plate girder stringers 48 in. deep were borrowed from the bridge floor to support the traveler tracks, and the trusses were carried at main panel points on solid camber blocking on alternate sets of five and six 16x12-in. longitudinal timbers laid close together across the tops of the trestle caps. The falsework caps were carefully leveled, and the camber blocking was accurately cut to conform to a diagram of no stress, an additional camber allowance of 2 to 3 in. being made to compensate for settlement and insure rapid driving. The falsework was made entirely of long-leaf yellow pine and Washington fir. On the Illinois side the timber was stored and framed at Pier I and at a point on the line of the Chicago & Eastern Illinois tracks about one mile north of the bridge. On the Missouri side there was one yard two miles north of the bridge.

Large steel yards were provided to allow convenient storage and rapid handling of the bridge members, which were delivered in equal quantities on both sides of the river. One yard was on the right of way close to the Illinois end of the bridge



Reference Diagram of Cantilever and Suspended Span.



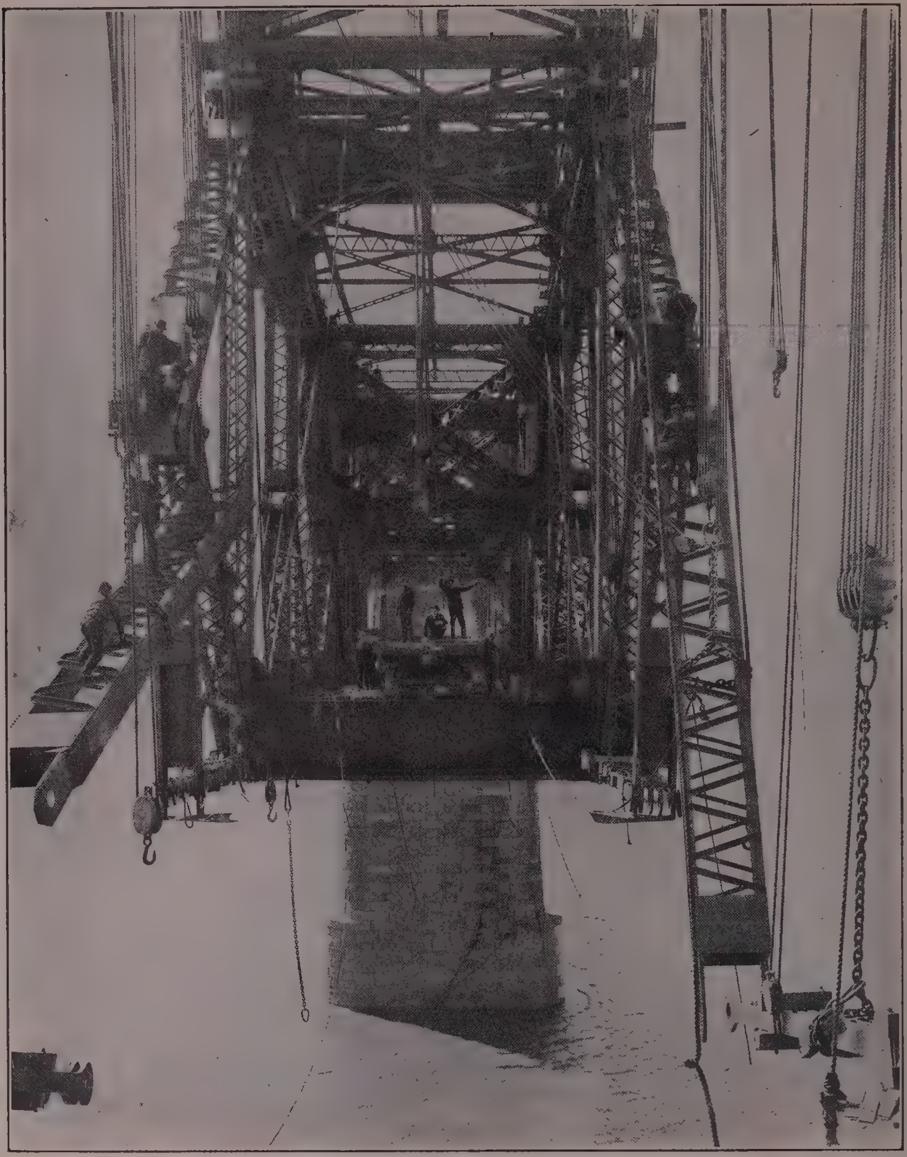
Falsework Tower.

The Engineering Record

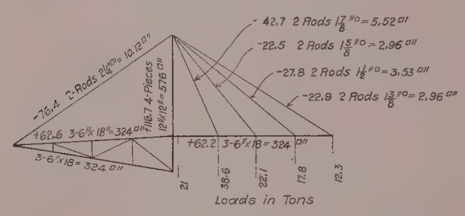
Falsework for Anchor Arms and Connecting Spans.

and the other was 2½ miles north of the bridge on the Missouri side. All steel and timber was loaded and unloaded by four self-propelling wooden derrick cars of 20 tons capacity. Carloads of material were delivered to the bridge by locomotives except for Span V and the west half of the center span, for which the material was drawn by locomotives from the yard to an incline, where it was transferred to barges and towed to Pier IV. A 50-hp., double-drum, hoisting engine and a steel derrick were installed on the pier top on a tower partly composed of the end of Span 4, and the materials were hoisted up from the 10 and 12-car barges, loaded on push cars and sent to their destination for Spans 3 and 5. Lower chord pieces weighing 40 tons were lifted by the derrick on Pier IV.

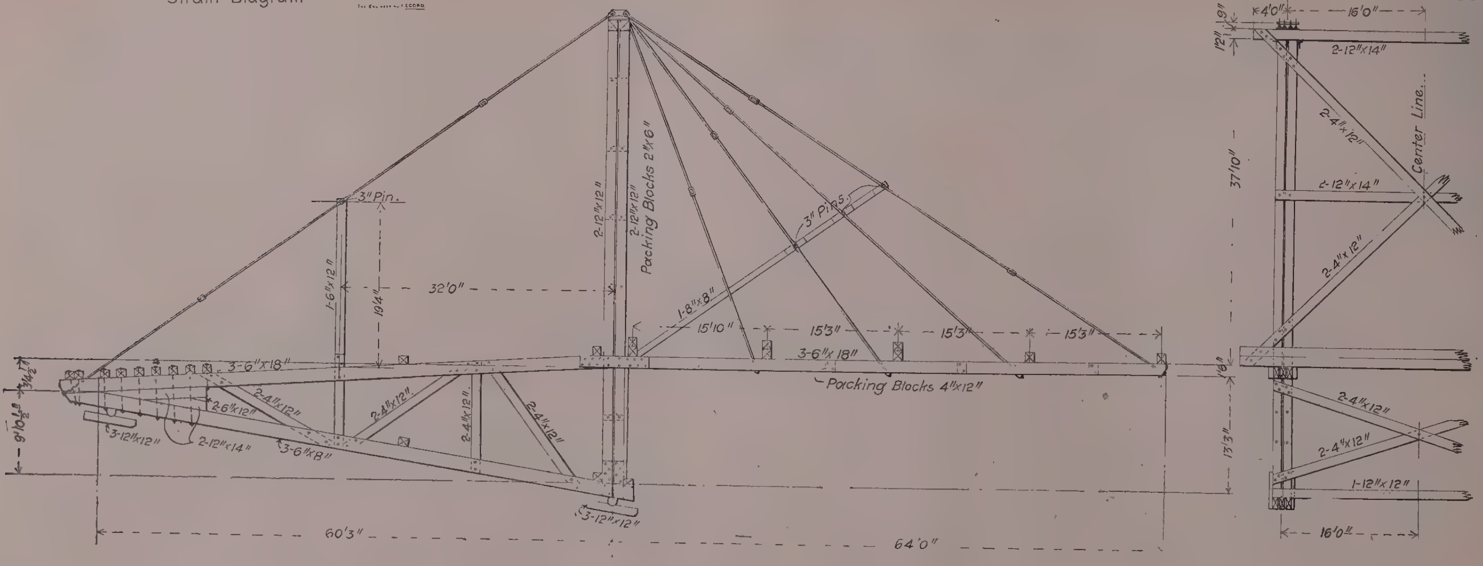
Erection was commenced simultaneously on both sides of the river in the middle of the intermediate spans and progressed on falsework both ways to the river piers and to the abutments, after which it was continued between the center piers by the cantilever method. The sequence of operations on the Illinois side was as follows: Pedestals and shoes were set on Piers I and II; bottom chords assembled and splices riveted from Piers I to III; floor system assembled from Pier I to III; trusses of Span 2 were erected from middle panel to Pier III by the gantry traveler; traveler returned to middle panel and completed the erection of span to Pier II; traveler erected cantilever arm of Span 1; traveler moved to center of suspended trusses in Span 1 and erected the span to Pier I; traveler returned to center of trusses and completed their erection to the end of the cantilever arm near Pier II, thus completing the erection on the Illinois falsework. The same sequence was followed on the Missouri side.



Assembling One Panel of Cantilever Arm with Overhead Traveler.



Strain Diagram



Cantilever Traveler.

Overhead Traveler for Cantilever Erection.

The gantry travelers were of the ordinary type, built chiefly of 12x12-in., 10x12-in. and 4x12-in. yellow pine and fir timber and mounted on four 4-wheel trucks on standard-gauge tracks 46 ft. apart on centers. They were about 101 ft. high over all, with vertical and horizontal clearances of 81½ ft. and 40 ft., respectively. The travelers were rigged with 8-part, 1¾-in. manila rope main tackles and 1½-in. manila rope runners and small tackles, all operated by one 6-spool and one 8-spool hoisting engine, carried on cars on standard-gauge tracks directly behind the travelers. The travelers were secured by four guy lines from the top of each to the falsework, by chocks under the wheels and by clamps operated by steamboat ratchets.

All bottom chord pins on the shore and fixed spans were driven from the outside. All top chord pins were driven from the inside. A 2,500-lb. ram, suspended from 1¼-in. line, was used.

Standard pilots were used at all points except *LS5* and *LS6*, where small clearances necessitated a special type of pilot. On top and bottom chord splices all shore and fixed span rivets were driven with three special bull machines having alligator jaws. These machines were carried from point to point on small frames. All field rivets (about 200,000) were driven by air. At post connections, floor beams and cantilever span splices rivets were bucked up with a pneumatic bucker. Elsewhere rivets were bucked up by hand.

The 671-ft. center span was erected simultaneously from Piers III and IV by a pair of overhead simple cantilever travelers, which consisted practically of king-post, combination trusses, moving with oak shoes on the completed top chords. Each traveler was about 128 ft. long and 57 ft. high over all, and was made with two triangular trusses with lateral X-bracing in the plane of the approximately horizontal lower chord. Inclined sills, parallel to the top chords of the cantilever arms of the bridge, were provided to maintain the main posts of the travelers in vertical positions at the commencement of operations. When they reached the horizontal top chords of the center suspended span the rear ends of these sills were supported on transverse vertical bents about 15 ft. high to maintain the travelers in the same position relative to the horizontal.

Counterweight platforms were provided at the rear of the travelers, and when in service they were anchored by lashings to the top chords and by cables to the bottom chords of the bridge trusses. The stresses in each traveler were computed for the dead loads due to its own weight, to that of the men, tackles and ballast and for the maximum and simultaneous live loads due to the different bridge members supported by it, their sums giving the maximum amounts noted at panel points of the stress diagram. The total estimated weight of each traveler was 187,000 lb., including 16,000 lb. for the rigging and 28,000 lb. for the suspended platform. Each traveler was operated by a 6-spool and an 8-spool hoisting engine carried on a car on the track on the bridge floor, as for the gantry travelers.

The concentrated loads imposed by these travelers developed erection stresses in the bridge trusses in excess of their working stresses and reinforcing pieces and shores of 12x12-in. timber were used for several members. The top chord eyebars were also reinforced by runways made with five pieces of 8x16-in. timber in each panel.

Adjustment wedges governed by screws operated by the hoisting engines turning the ratchet and pawl levers were inserted in the top and bottom chords. They were set at first, as usual, so as to bring the lower chords slightly above their final positions. In making the center panel adjustments diagonals *LS4-MS5* were erected first, then the following members in order: *US4-MS5*, *LS4-LS5*, *MS5-LS6*. Pins at *LS6* were then driven, followed by pins at *LS5*. Wedges were then released until connections at *MS5* were made. Top chords *US4-US6* being held in traveler falls, the top wedges were then released, and splice at *US6* was then bolted. Wedges were kept perfectly clean and lubricated by a mixture of tallow, graphite and beeswax. No difficulty was experienced in making the final connections, and the 671-ft. span, weighing about 3,900 tons, was successfully swung without any field fitting.

Besides the apparatus already mentioned, the principal items of the erection plant included a locomotive, a tug, a steamboat, two car transfer barges, two air-compressor plants, a 10-ton steel derrick and a 4-spool hoisting engine.

Mr. Alfred Noble and Mr. Ralph Modjeski were the engineers of the bridge, and The American Bridge Co. of New Jersey, Mr. Paul L. Wolfel chief engineer, was the contractor for the superstructure, which was built at the Pencoyd and Lassig plants. The American Bridge Co. of New York, Mr. S. P. Mitchell, chief engineer, was the contractor for the erection, which was executed on a sub-contract let to The Kelly-Atkinson Construction Co., Chicago, Mr. F. C. Fisher, engineer in charge.

Damages from Defective Sewerage cannot be collected by injured property holders from a city under certain circumstances. This is well established by decisions of the courts of many States, yet such suits are frequently brought. The Maine Supreme Court recently stated the law as follows, in Keeley v. City of Portland, 61 Atl. Rep. 180: A municipal corporation is not responsible in damages for injuries caused to a person's property by the flowing back of water and sewage from a public sewer with which the property is connected, where this injury results entirely from some fault in the location or plan of construction of the sewer or in the general design of the sewer system, and not at all because of any want of repair or failure of the municipality to maintain the sewer to the standard of efficiency of its original plan of construction.

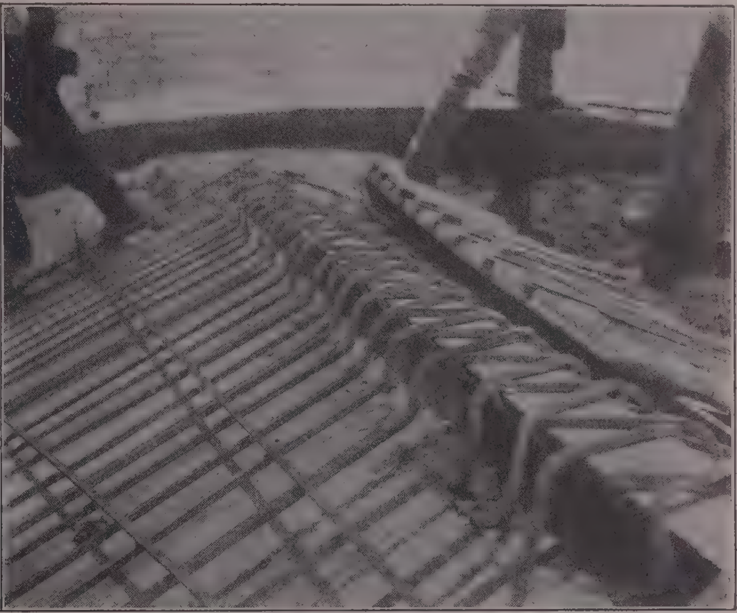
A Reinforced Concrete Coal Pocket, Atlantic City Water Works.

By Kenneth Allen, M. Am. Soc. C. E., Engineer and Superintendent.

A somewhat unique form of reinforced concrete coal pocket has just been completed by the Water Department of Atlantic City, N. J. Heretofore all coal, which has to be hauled by wagon, has been handled by hand, first in unloading to the bin and then in loading the charging car. With the present arrangement the coal is dumped on to a grating of wrought steel bars spaced 6 in., center to center, through which it passes to a steel plate dumping hopper 4x4-ft. in plan, set in a concrete lined pit 7 ft. 9 in. deep inside. On admission to the lower part of the hopper by a gate adjustable by hand the coal is picked up by a coal elevator and conveyed to a point above the center of the coal pocket where it is dumped.

The coal pocket, as shown by the cuts, is cylindrical, 30 ft. in diameter inside, with a conical bottom and pyramidal roof, making available in this way, its entire contents for storage. Its capacity is 400 tons or sufficient for about 25 days' supply in summer or 50 days' supply in winter. Passing down the coal is dumped from the bottom by a Link Belt undercut gate and chute into the charging car.

General Appearance of Bin.



Reinforcement of Roof.

The driving machinery consists of a 10-h.p. vertical "O. & S." engine installed in an adjacent machine shop, built under the same contract, a manila rope drive transmission from the counter shaft to the elevator head and a friction clutch. There is also a clutch coupling on the countershaft on the opposite side to enable the same power to be used for the lathes and other machinery in the shop.

The machine shop and tool house are near the north part of the pumping station and about 40 ft. from the boiler room. The coal pocket is between the boiler room and the machine shop and tool house. The top of the foundations is on a level with the top of foundation of the main pumping station in the case of the shop and 2 ft. below this in the case of the coal pocket.

The following are the approximate quantities of material in the work: Excavation, 233 cu. yd.; concrete, 317 cu. yd.; steel reinforcement, 13,700 lb.; steel beams, plates, etc., 3,250 lb.; 3-in. downspouts, 210 lin. ft. For all work above the foundation the forms were of matched lumber planed on one side only. The rough side was placed on the side in contact with the concrete on exterior surfaces, but on all other surfaces the planed side was placed next the concrete. In mixing concrete all ingredients were added by actual measurement. The sand and cement were first thoroughly mixed dry until of uniform color. A moderate dose of water was then added and the whole worked over until furnishing a mortar of uniform consistency. The broken stone and gravel were separately and similarly mixed and then wet by dashing with water. Finally the mortar was added to the broken stone and gravel with sufficient water to make a wet mixture, and thoroughly worked over until entirely homogeneous.

The steel reinforcing having been previously placed and secured in position as shown in the plans, the concrete was placed in the forms and, if necessary, rammed to ensure the complete enveloping of and contact with the steel. On leaving the work the fresh concrete was kept moist and protected from the direct sunshine, and the forms in which it was laid were not removed for at least 24 hours after placing the concrete.

The reinforcement was of homogeneous mild steel having an ultimate tensile strength of 55,000 to 65,000 lb., an elongation in 8 in. of not less than 24 per cent. and a reduction of area of not less than 40 per cent. at the point of fracture in a test bar 8 in. long. It was also required to withstand being bent when cold back flat upon itself without showing signs of fracture. Unless otherwise specified its nearest side was not less than 1 in., nor, where practicable, more than 2 in. from the finished face of the concrete. The reinforcement overlaps sufficiently to develop the full strength of the wall where such overlap occurs.

Laying Concrete for Bin Bottom.

Forms for Bottom of Coal Bin.

All surfaces above the foundation except the interior of the coal pocket and the roof were given a coat of neat cement grout mixed with lamp black, applied with a brush. The roof was finished on top with 1 in. of 1:2 cement plaster applied to the concrete while green and floated to a uniform surface, forming an impervious cover similar to a granolithic pavement.

The contract was let on March 31 to W. W. Lindsay & Co., of Philadelphia (who sub-let the contract for elevating machinery to the Link Belt Co., of Nicetown), for the following sums: Coal pocket, $3,795; elevating machinery, $2,650; extra work allowed, $37.50; total cost, $6,482.50.

Alpha cement was used and an excellent bank sand with 38 per cent. voids was obtained from the pumping station grounds. A superior gravel, also with 38 per cent. voids, of silicious material being also obtainable nearby, the contractor was permitted to substitute this for the broken stone originally specified with the understanding that the mixture should be of 1 part of cement, 2½ parts of sand and 5 parts of gravel, and that the gravel must be cleaned and screened so as to be from ¼ to ¾ in. in size for the shell of the coal pocket, and from ¼ to 2 in. in size for the other work. The contractor paid the Department 10 cents per cubic yard for sand and 20 cents per cubic yard for gravel, doing all excavation, screening, hauling and washing himself. Test bars of the concrete weighed exactly 150 lbs. per cubic foot.

Although the specifications permitted the use of patented forms of reinforcing material, plain square bars of medium steel were adopted as most satisfactory. The vertical bars necessarily projected at first some distance above the forms and at this time there were several days of high wind, causing them to sway more or less. It was subsequently found by testing with a hammer that the lower foot or two of six pilasters were not sound, the noise indicating a hollow space. After the work was completed these places were torn out and the bond between the steel and concrete found imperfect. These places were then carefully filled with fresh concrete which has apparently made the walls perfectly solid at these points. Further difficulty from this cause was avoided by securing the rods more firmly to the forms until the concrete was laid. The roof was made particularly strong, as it was not known beforehand what kind of power transmission or head house would be adopted or what their weight would be.

On the completion of the work, July 31, a test of the capacity of the coal elevator was made, showing this to be double that called for, or 15 tons in 31 minutes. It should be said, too, that the Link Belt Co. furnished their standard insurance policy, guaranteeing the elevating machinery for 5 years, although this was not called for by the specifications.

High Strength Steels have been investigated by M. H. Le Chatelier in order to ascertain their availability for long span girders for special purposes. In one case a reduction from 50,600 to 28,600 lb. was made possible by substituting hard special steel for mild steel of the ordinary quality for such uses.

Book Notes.

The annual report on stream measurements made in 1904 under the direction of the U. S. Geological Survey is published in twelve parts, six giving data collected east of the Mississipi and six the data collected west of that stream. These reports are too well known to need extended review, for they have become invaluable to all engineers engaged in hydraulic power developments and the water supply of cities.

A book that will prove useful to all students of railroad affairs is the "Index-Digest of the Reported Decisions, Precedents and General Principles Enunciated by the Massachusetts Board of Railroad Commissioners from 1870 to 1904 Inclusive." It has been compiled by Mr. Charles E. Mann, clerk of the Board, and includes the digest of 1870-1888 prepared by Prof. John H. Wigmore. It is similar in its character to the digests of judicial opinions which are so necessary to lawyers, but it also contains many notes on engineering precedents and rules. The Massachusetts Board is everywhere acknowledged to be the most important state organization of its kind in the country, and this handy summary of its decisions is of correspondingly high value.

A few months ago reference was made in these notes to Prof. A. P. Jamison's "Elements of Mechanical Drawing." He has recently brought out a second work entitled "Advanced Mechanical Drawing," in which the student is given the fundamental principles of projection, shadows and perspective. Some knowledge of descriptive geometry is necessary to follow the course outlined. The first subject taken up is the theory of isometric and Cavalier projections. The author begins with the elementary basis of this kind of drawing, and proceeds step by step to the delineation of screw-threads. The discussion of shadows is carried only so far as needed to explain the proper shading of mechanical drawings. Perspective is explained clearly and with careful attention to grading the steps of the student's progress from elementary to the complicated examples. Some good suggestions concerning the assumption of conditions and the perspective of shadows are given. The book closes with a well-arranged collection of problems, both theoretical and practical. The book is unusually well adapted for engineering students, as it is practical in its applications without any sacrifice of accuracy. Moreover, it deserves a special word of praise for the brief but good suggestions concerning the lettering of drawings. (New York, John Wiley & Sons; cloth, $2.00.)

The misfortunes that have followed the attempt to settle questions involving water rights according to British common law, in countries of moderate or scanty rainfall, have been discussed at length in this journal. The law of water in Southern Europe is far better for our semi-arid and arid districts, as can be seen by a study of "Roman Water Law." In this work, Eugene F. Ware, of the Topeka bar, gives a careful translation of every passage in the pandects of Justinian relating to accretions, alluvion, aqueducts, arches, baths, bridges, canals, cisterns, conduits, dams, ditches, drains, drawing water, drip, driveways, dikes, ferries, fishing, fish ponds, footpaths, fords, fountains, head-gates, hot water, irrigation, islands, jus gentium, lakes, levees, limitations, marshes, mills, nonuser, percolation, pipes, ponds, procedure, public ways, rains, rain water, repairs, reservoirs, right-of-way, river banks, rivers, roadways, sewers, sluiceways, springs, storms, streams, watering cattle, water rights, water-ways, water-works, water-wheels and wells. It will surprise anyone who reads the Roman water law to see how perfectly and fully the law writers understood the whole question as presented in a country where the rainfall is not profuse. They had worked out most of the problems with a display of equity and common sense which has unfortunately not been observed in many of the States west of the Missouri River. It should be added that these extracts give all the Roman and Spanish law in force at the time of the Spanish conquest of Mexico, and the French civil law at the time of the acquisition of Louisiana, so far as it relates to the law of fresh water. (St. Paul, West Publishing Co.; half morocco, $2.50.)

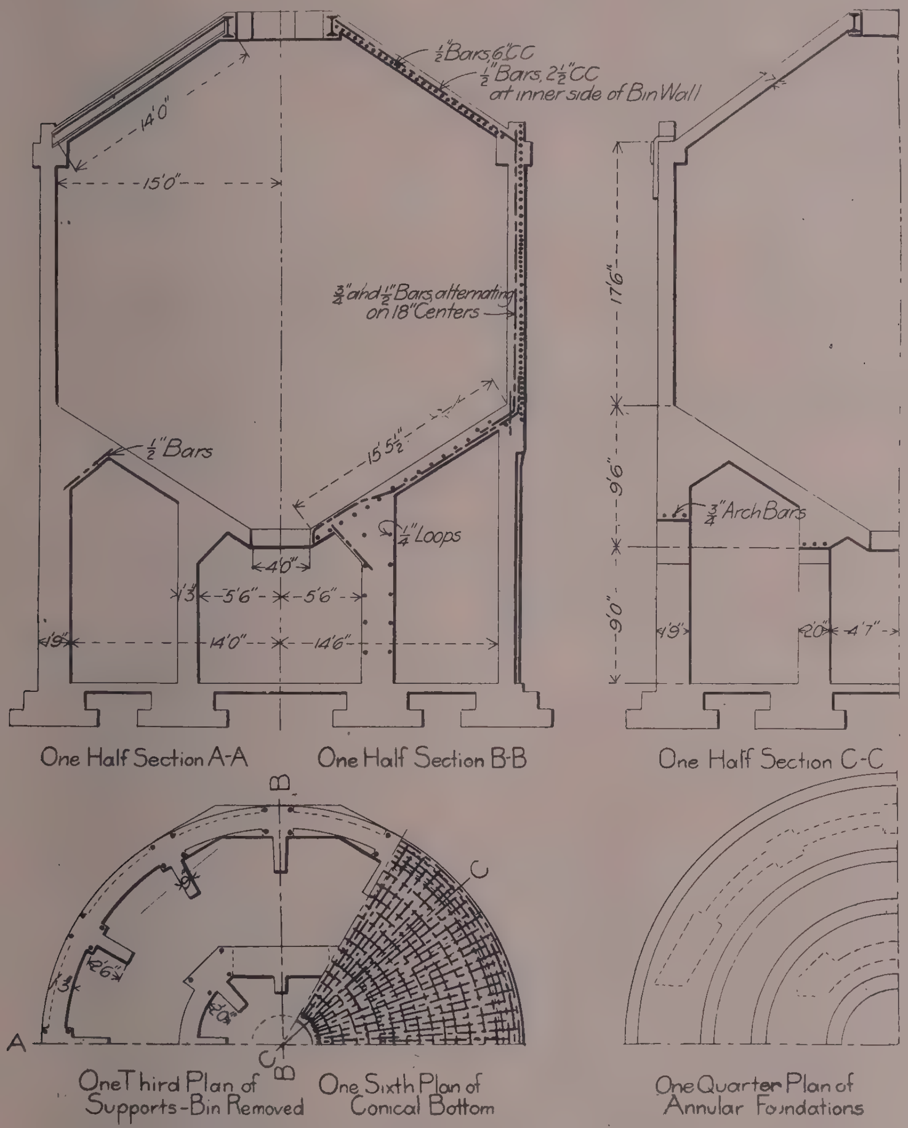

½" Bars, 6" C.C.
½" Bars, 2½" C.C. at inner side of Bin Wall
14'0"
15'0"
¾" and ½" Bars alternating on 18" Centers
½" Bars
15' 5½"
¼" Loops
4'0"
1'3"
5'6"
5'6"
1'9"
14'0"
14'6"
17'6"
9'6"
9'0"
¾" Arch Bars
1'8"
2'0"
4'7"
One Half Section A-A
One Half Section B-B
One Half Section C-C
B
C
A
C
B
1'3"
2'6"
One Third Plan of Supports-Bin Removed
One Sixth Plan of Conical Bottom
One Quarter Plan of Annular Foundations

Diagram of Reinforced Concrete Coal Bin, Absecon Pumping Station, Atlantic City.

Dynamics of Particles and of Rigid, Elastic and Fluid Bodies. By A. G. Webster. Leipzig, B. G. Teubner; paper, 8vo., 600 pp.

It is rather surprising that such an excellent work by an American professor should be published in Germany, particularly as it is not so strictly mathematical as most German books on the subject. On the contrary, historical notes, statements of the practical application of many of the formulas, and marked clearness and brevity in style rouse the student's interest in a way that may seem somewhat unscholarly to those who still believe there can be no royal road to learning.

The work divides itself naturally into three parts, the first of which considers the laws of motion in general and those methods which are applicable to systems of all sorts. The separate chapters of this part include kinematics of a point, laws of motion, general principles (such as that of virtual work), work and energy, principle of least action, LaGrange's equations, oscillations and cyclic motions.

The second part is devoted to the dynamics of rigid bodies, and is divided into two chapters, one dealing with systems of vectors, moments of inertia, centrifugal forces, etc.; the other, with the dynamics of rotating bodies.

The third part divides itself from the other two from the fact that in it the differential equations are partial, and in the others they are ordinary. As a preparation for this subject there is a full discussion of the theory of the potential function, which introduces the most important mathematical theorems and prepares for the subsequent chapters. Next follows the dynamics of stress and strain, the statics of fluids, the problem of de St. Venant on the flexion and torsion of prisms, and hydrodynamics. In this last chapter there are but 62 pages but there is a most satisfactory treatment of both irrotational and vortex motion, of wave motion, and of viscous fluids. At the end of the book there are five notes dealing with mathematical difficulties which have arisen in various chapters.

The Crystallization of Iron and Steel. An Introduction to the Study of Metallurgy. By Dr. J. W. Mellor. New York, Longmans, Green & Co.; cloth, 12mo, 154 pp., $1.60.

This "introduction" to one of the most interesting recent developments of physical research is an elaboration of six lectures given last winter at Newcastle. The literature of metallography has reached such a bulk that an engineer, with but few hours for study, is driven from it by its mere mass. Even if he undertakes its study he has much trouble in ascertaining what is certain and what is merely controversial matter. Dr. Howe's admirable "Iron, Steel and Other Alloys," is a pretty difficult treatise to struggle with after a hard day's work. But no engineer who uses iron and steel can afford to neglect the results of the work of metallurgists in the physical chemistry of iron and steel, and for this reason Dr. Mellor's book has a special value. The results of this research have already had sufficient practical effect on the industry to demonstrate that progress for a time will be directed by them very largely.

The author first explains the modern view of the solidification and cooling of alloys, and introduces the reader to the physical phenomena that are at the basis of metallography. In the next chapter, on the constituents of iron and steel, eutexia, solid solutions and the phase rule are explained, and the properties of ferrite, cementite, pearlite, sorbite and other ites are described. These two chapters are preparatory for the next three; in which the effect of various external influences on the internal character of steel is discussed. Hardening, annealing, tempering, hot and cold working acquire new and deep significance when studied in the light of the metallographist's revelations, and the engineer will find a great deal of interesting information of a practical nature in the researches into the effect of stress and strain on the crystalline and intergranular condition of steel. Finally, the author gives a description of the methods of preparing specimens for microscopic study and an excellent glossary of the terms used in metallography. The book is, in a sense, extremely elementary, yet those who have not been following this field will find it a clear and well-illustrated introduction to the subject.

Granite Asphalt has been given a trial in Paris lately as a substitute for the usual rock asphalt in situations where it is necessary to keep down the slippery properties of a pavement. It consists of various grades of crushed stone, particularly granite chippings, mixed with hot natural asphalt in an ordinary tar boiler. The pavement is stated to be much harder than the rock asphalt pavements laid in that city and to give very satisfactory results.

Letters to the Editor.

Packing and Binders for Roads.

Sir: A few days ago I came across in "Engineering" an article by Mr. Reginald Ryves on broken-stone roads in which there are some notes concerning packing and binding that do not agree with my experience. It is true that our climate may be so different from that of England as to cause good practice there to be poor practice here, but is it not possible that the author may be somewhat mistaken in the general deductions he draws from a limited range of experience? He states that the choice of a binding material is frequently affected by the kind of stone employed. When a stone wears to a slimy mud, he says, sand, grit or chips of silicious rock are better binders than a clayey material; when, however, sand or grit is the chief or sole detritus, clay is a better binder than sand. My own observation has been quite different from this. In the roads with which I have been familiar enough to speak with certainty, the right binder to use has been more dependent on traffic than road metal. The engineers in this State are not given much money for broken stone roads, and often the metalling they employ is not the best adapted for the traffic to be borne. Consequently they are forced to use a binder which will make up the deficiencies of the stone. Where the latter is very hard and the traffic is light, such as buggies and light delivery wagons, it seems very hard to keep the macadam in condition during dry weather, but my observation has been that in our climate plain loam was better as a packing under these conditions than anything else. This is, of course, rank heresy, but it is my experience. In the same way I have found with most limestones that it was best to use only limestone screenings as a packing and binder, unless the traffic was very light and the climate very dry. These screenings seem to cement with larger stones and form a half solid mass or conglomerate, if wet and consolidated enough.

Perhaps I have misunderstood Mr. Ryves' comments, for in another part of his article he says that on main roads clay should never do more than fill the interstices between stones, or stones and chips, which are jammed tightly together. On a road which is regularly swept and sometimes watered, more importance may be attached to the binder as a packer, he says, and less to its direct effect upon the traffic. This is apparently a confirmation of my own opinion that binding materials should be selected with a due regard for the traffic as well as the quality of the metal. Mr. Ryves makes a further suggestion that is a decidedly good one; it is to use a cheap local material, with cheap stone in the lower layer, and a little of just the right material for the stone used as a wearing layer.

Another matter that may be mentioned in this connection is the protection of roads. When I first became connected with work of this nature there was an English foreman, lately arrived in the country, in charge of the men. He insisted that trees must be thinned away from the sides of the roads, and finally produced some printed rules, prepared in England, making the same claim. I have since found this suggestion in a book by Thomas Coddington, but in the face of all this English precedent I am sure that we need to shelter our roads as much as practicable by trees. Where this is not done I have noticed that the binder and packing are blown away, and the surface unravels. I think that if others of your readers would discuss these aspects of binding material the result would be useful to many of us.

Yours truly,
Andrew Francis.

Sacramento, Sept. 4.

Editing Technical Societies' Publications.

Sir: In reading over the discussions of the papers published in the "Transactions" of the American Institute of Electrical Engineers, January to December, 1904, vol. xxviii., I am forcibly impressed with the awkwardness of style introduced into the discussions by the use of the third person, and I respectfully beg permission to trespass upon your valuable space to give expression to my opinion on this subject which, I have no doubt, is indorsed by a large number of engineers who do not belong to that category of scientific prigs of which I have a sincere horror. I wish to take at random some statements which the editor of the discussions put into the mouth of Mr. Gano S. Dunn, but which this thoughtful gentleman surely never said. On page 329 we find Mr. Dunn's discussion of a paper on alternating-current generators, and we have to look at the following sentence: "Mr. Dunn expressed appreciation of Mr. Behrend's views in his book on Induction Motors, and also as given verbally to the meeting, to the effect that engineering and designing of the kind under discussion was not a science, but an art." In parsing this sentence, it is Mr. Dunn, who, in his book on "Induction Motors," expressed appreciation of Mr. Behrend's views, whereas Mr. Dunn in reality referred to Mr. Behrend's views as expressed by Mr. Behrend in his book on "Induction Motors." The jumble introduced by transposition from the first person into the third person is obvious here.

Let us turn to another page. We read on page 135, as coming from Mr. C. F. Scott: "The mention of the speaker's name in the paper suggests some reminiscences of early work on this subject." I suppose that this means that mention of Mr. Scott's name in the paper suggests to Mr. Scott some reminiscences of his early work, but then why not say so? By completely destroying the individuality of discussions and making them read like the most insipid and uninteresting matter imaginable, we deprive oral discussion of its interest, charm and peculiar advantage over common technical publication. The discussion loses flavor and strength and is completely emasculated.

Furthermore, if it is pleaded that the third person is introduced into discussions in order to lend to these discussions the cloak of placid philosophical calmness which, in my opinion, would be very much out of place in engineering discussions of the day, there should at least prevail scholastic consistency; but we find Prof. H. J. Ryan, on page 140, saying: "Probably you are right, that the constants will be somewhat different for these different metals." How much more dignified it would have sounded in the editor's opinion if put this way: H. J. Ryan:—"The speaker then remarked that the former speaker was probably right, and that the constants," etc. This would introduce such a large variety of speakers that it might be necessary to use suffixes for the speakers and, perhaps, we may, sooner or later, be presented with a proposition of settling at a future Congress the question of the nomenclature and terminology to be used at the discussions to differentiate between the different speakers! Alas, alas!

The discussion of engineering matters before the engineering societies is of great value in the progress of engineering and, the livelier these discussions can be made, the more benefit there is derived from them. In the discussion of astronomic problems while dealing with the immensities and eternities and with the slowly changing phenomena of the universe, it may be good taste to avoid the introduction of personality or individuality as small and puny in comparison with the great problems under discussion; but while discussing engineering problems which are distinctly the work of man, man's individuality should stand forth and it will give to a discussion a certain flavor of interest which otherwise it never could obtain.

B. A. Behrend.

Cincinnati, O.

[The criticism given above is doubtless warranted by the editorial work referred to, but it should be borne in mind that the methods followed in the particular volume to which reference is made are open to great improvement. In such editorial revision of oral remarks and written communications, the results are likely to be uncouth until both speakers and editors become more familiar with the real purpose of these technical publications of the engineering societies. The matter was a serious one with the American Society of Civil Engineers ten years ago, when the late George S. Morison was elected president and began the resuscitation of that organization from its comatose condition. One of the first reforms he introduced was connected with the Society's publications, in which he was ably assisted by Prof. Wm. H. Burr, Mr. Foster Crowell, Secretary Chas. Warren Hunt and a few others who formed the publication committee of the Society. Previously the technical discussions were printed as reported by the stenographer, with such corrections of grammar as are always needed in revising oral statements. In this form the discussions were discursive and full of repetition which had no good results. This committee was familiar with the editorial style of the Institution of Civil Engineers, which condenses discussions more than is done by any other similar organization, but it did not like the exclusive use of the past tense which characterizes British reporting. Accordingly the committee ordered the editorial work to be carried out by eliminating repetition of similar statements by different speakers and all remarks not pertinent to the subject, as well as by condensing discursive statements. It was decided, after some experiment, to refer to the author of the paper either by name or as the author, anyone who took part in oral discussions was referred to as the speaker or by name, while any one who communicated a written discussion was to be known as the writer or else by name. In carrying out these directions the first editorial productions were as poor as those to which Mr. Behrend takes exception. While the work of condensation and elimination was all right, the exclusive use of the third person produced weird results, which finally led Mr. Morison to take charge of the education of the Society's employe then doing the back work on the "Transactions." Mr. Morison solved the trouble with characteristic sagacity by showing that it is hardly ever necessary to use the word "speaker" in reporting. It was his idea, unquestionably correct, that the individuality of oral remarks could be best preserved by eliminating all personal references from them, but following the style, so far as possible, reserving the word "speaker" for use in expressing experiences and differences of opinion almost exclusively; for example: "The speaker has seen a pile of cement, etc.;" "The speaker is convinced, however, that it is unnecessary, except perhaps for heavy railroad bridges, to use the net section in designing plate-girder webs." Of late years, the old rules regarding elimination of bouquets to the authors, repetition of statements and the like have been much relaxed, and as a result the volumes are not edited down like those of the Institution of Civil Engineers. On the other hand, they are far more readable and might well be used as models by the editors of the American Institute of Electrical Engineers.]

Private Fire Services are now regularly inspected in Lowell, Mass., by a representative of the Water Department. The results amply justify the expense.

CURRENT NEWS SUPPLEMENT

SEPTEMBER 16, 1905.

DIRECTORY OF NATIONAL TECHNICAL AND TRADE SOCIETIES.

American Society of Civil Engineers. Secretary, Chas. Warren Hunt, 220 West 57th St., New York. Next meeting, Sept. 20, paper on river and harbor improvements.

American Society of Mechanical Engineers. Secretary, F. R. Hutton, 12 West 31st St., New York.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, 95 Liberty St., New York.

National Fire Protection Association. Secretary, W. H. Merrill, Jr., Chicago.

American Institute of Mining Engineers. Secretary, R. W. Raymond, 99 John St., New York.

American Institute of Architects. Secretary, Glenn Brown, Washington, D. C.

Association of Engineering Societies. Secretary, Frederick Brooks, 31 Milk Street, Boston, Mass.

American Society of Heating and Ventilating Engineers. Secretary, W. M. Mackay, 235 Water St., New York.

Canadian Society of Civil Engineers. Secretary, Clement H. McLeod, 877 Dorchester St., Montreal.

American Public Health Association. Secretary, Dr. C. O. Probst, Columbus, O. Annual meeting, Boston, Sept. 25-29.

Society for the Promotion of Engineering Education. Secretary, Prof. M. S. Ketchum, University of Colorado, Boulder, Colo.

American Society for Testing Materials. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Municipal Improvements. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y.

Association of Railway Superintendents of Bridges and Buildings. Secretary, S. F. Paterson, Concord, N. H.

American Railway Engineering and Maintenance of Way Association.. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago.

American Water-Works Association.. Secretary, J. M. Diven, Charleston, S. C.

American Foundrymen's Association. Secretary, Richard Moldenke, P. O. Box 432, New York.

Engine Builders' Association of the United States. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

American Public Works Association. Secretary, W. H. Flint, Chattanooga.

Association of American Portland Cement Manufacturers. President, J. B. Lober, 1232 Land Title Building, Philadelphia.

National Association of Manufacturers of Sand-Lime Products. Secretary, H. A. Duerr, Wilmington, Del. Next meeting, Dec. 5-7, Detroit.

A NEW DEVICE FOR CONCRETE REINFORCEMENT.

A recent invention of interest to reinforced concrete designers and contractors furnishes a method of securing an inclined shear bar to a horizontal reinforcing bar, the attachment being at the same time rigid and economical and allowing the shear bars to be spaced independently of any but theoretical considerations. The invention consists primarily of a steel key, shaped in section very much like a melon seed. A nick is made with a cold chisel on the under side of the reinforcing bar at the point where it is desired to locate the stirrup. The wire stirrups are bent to shape over molds and are then dropped into place on the reinforcing bar and the key inserted. Finally, an extra half turn is put into the loop above the bar, thus drawing the key firmly into its seat and locking the stirrup in place.

This form of stirrup has several points of advantage over the styles of vertical reinforcement now in use. The spacing and length of stirrups are controlled by the designer instead of being determined by the process of manufacture of the reinforcing bar, and at the same time they are rigidly attached to the tension bar and cross the potential shear cracks at right angles. The shear stresses are transmitted directly from the stirrups to the tension bars without locally straining the concrete at the point of connection. Keys sufficient to erect any ordinary job can be carried in stock at a small expense and used after the job is secured with whatever bar promises the quickest delivery. Bars of high carbon or structural steel, plain or deformed, can be used as the engineer desires. A plain bar fitted with these stirrups has a bond in the concrete similar to a deformed bar without them, and costs less besides reinforcing the beam vertically. A patent covering this key has been awarded to C. W. Noble, 3121 Michigan Ave., Kansas City, Mo., and arrangements are now being made for putting the article on the market.

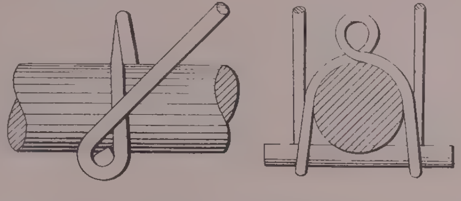
THE WESTERN PACIFIC RAILWAY.

The first official statement concerning the Western Pacific Ry. was made a few days ago by Pres. E. T. Jeffery, of the Denver & Rio Grande R. R. It was addressed to the stockholders of the latter company and reads as follows:

For many years, while the line of railway between Ogden and San Francisco was uncontrolled by interests competitive with your system, your company enjoyed a satisfactory share of the traffic to and from California, and one of the reasons moving the management, between four and five years ago, to acquire the Rio Grande Western, was the closer relationship that would be established with the San Francisco line of the Southern Pacific Co. and the freer interchange that it seemed probable would result therefrom. Subsequent events were in a measure disappointing. The control of Southern Pacific by Union Pacific interests has led to unexpected restrictions on interchange, and, more especially, unlooked for impediments in the way of securing traffic in territory reached by the Southern Pacific line.

These considerations, in connection with the rapid development of the commercial, agricultural and industrial interests on the Pacific coast, and the increase of commerce with the Philippines, China and Japan, led the management, reluctantly, to investigate the feasibility of an independent line, in your interest, from either Salt Lake City or Ogden, to San Francisco, with such branches and laterals as might from time to time be desirable for the development of natural resources within reasonable distance of the main stem.

With this end in view, and with a manifest obligation before it to advance your interests, the management assisted in promoting the plans of the Western Pacific Ry. Co., a corporation organized under the laws of the State of California for the purpose of building a main line of railway from San Francisco to Salt Lake City, with certain proposed branches, or laterals.



KEY FOR REINFORCED CONCRETE WORK.

Coincident with this, careful investigations and preliminary surveys were made, under the auspices of your company, some of them by its chief engineer, Mr. E. J. Yard, and his assistants, for the purpose of determining the best available route. These were supplemented by the professional services of Mr. Virgil G. Bogue, an engineer of experience, acting under the general direction of your company. These engineering efforts were successful beyond expectation and a main line has been definitely located, which, through the Sierra Nevada range of mountains, has a maximum gradient of 1 per cent. (52.8 ft. to the mile) in each direction, and lighter grades on both sides of the range, with satisfactory alignment throughout, and which, in general desirability and advantages, affords a route superior to any existing line to the California coast.

The management of the Western Pacific Ry. Co. cooperated and placed all their plans, surveys, and information at the disposal of your officers, and, after protracted negotiations, the control of their corporation was transferred to your company with all rights, franchises and property interests, including about 38 miles of railway in operation.

As planned, the main line between San Francisco and Salt Lake City will be substantially constructed, according to modern specifications, and will be laid with steel rails of a weight of 85 lb. per yard. It will connect at Salt Lake City with your Rio Grande Western Ry. and will use, jointly, the yards, station facilities, repair shops, etc., at that point, paying a reasonable rental therefor.

The Western Pacific Ry. Co. has at present an authorized capital of $50,000,000, which will be immediately increased to $75,000,000. The financial arrangements for the construction of the railway were completed in the last three months of the past fiscal year by the issue and sale to responsible bankers of $50,000,000 of first mortgage 5 per cent., thirty-year gold bonds of that company. It is estimated that the proceeds of this issue will cover the cost of the main line, with terminals and necessary equipment. By request of the bankers and with the approval of your directors, the president of your company has been elected president of the Western Pacific Co.

The interest accruing upon the Western Pacific Ry. Co.'s first mortgage bonds during the period of construction, to Sept. 1, 1908, has been provided for and will be included as a part of the cost of construction.

As a part of the plan for financing the Western Pacific Ry., contracts, pledged by assignment to Bowling Green Trust Co., trustee of the mortgage securing the bonds, and for the benefit of the holders thereof, were, on the part of the Denver & Rio Grande R. R. Co. and the Rio Grande Western Ry. Co., under appropriate corporate action, entered into with the Western Pacific Ry. Co., the principal features of which are:

First. In the event that the proceeds of the first mortgage bonds of the Western Pacific Ry. Co. shall prove insufficient to complete the main line of railway from San Francisco to Salt Lake City, with adequate terminals and terminal facilities, and equipment to the amount of $3,000,000, the Rio Grande Western Ry. Co. undertakes to provide sufficient funds to assure the completion, and if called upon to make any advances, it is to take second mortgage bonds of the Western Pacific Ry. Co., bearing interest at 5 per cent. per annum.

Second. The Denver & Rio Grande R. R. Co. and the Rio Grande Western Ry. Co., jointly, undertake to semi-annually make up any deficit in the earnings and income of the Western Pacific Ry. Co. in the amount required to meet its operating and maintenance expenses and taxes, and, after completion of the main line, the interest upon its first mortgage bonds, and, after Aug. 1, 1911, certain instalments due upon its sinking fund. For all advances so made they are to receive the promissory notes of the Western Pacific Ry. Co., payable out of its first available income. These advances on the part of the Denver & Rio Grande R. R. Co. and the Rio Grande Western Ry. Co. will be made only in the event and to the extent that the application of the proper available income of the Western Pacific Ry. Co. is insufficient to meet the above-mentioned obligations, which contingency is regarded as remote.

Third. Under the contracts with the Western Pacific Ry. Co., the Denver & Rio Grande R. R. Co. has now received 100,000 shares of the capital stock of the Western Pacific Ry. Co., and upon the increase of the capital stock, as above mentioned, will receive an additional 100,000 shares thereof. In like manner the Rio Grande Western Ry. Co. has received 150,000 shares, and will, upon such increase of the capital stock, receive an additional 150,000 shares.

Upon the completion of the increase of capital stock, the Denver & Rio Grande R. R. Co., and the Rio Grande Western Ry. Co. will, together, hold in their treasuries, 500,000 shares, of a par value of $50,000,000, out of a total capitalization of the Western Pacific Ry. Co. of 750,000 shares, of a par value of $75,000,000. This will place your company in the absolute control of the Western Pacific Ry. Co., without any immediate money outlay, and with only a contingent liability for the future.

You should be advised that the entire issue of first mortgage bonds of the Western Pacific Ry. Co. may be called in, under the terms of the mortgage, at any time prior to maturity, at 105 per cent. of face value with accrued interest.

In further support of the financing of the Western Pacific Ry. Co., and for the purpose of assuring it a fair share of trans-continental traffic, one of the contracts above mentioned, between the Denver & Rio Grande R. R. Co. and the Rio Grande Western Ry. Co., of the one part, and the Western Pacific Ry. Co., of the other part, also includes a traffic agreement. Provision is made for a joint through line of the Denver & Rio Grande, Rio Grande Western and Western Pacific Rys. This arrangement is not only of great advantage to each of the companies participating in such joint through line, but it also assures the Western Pacific Ry. Co. a lucrative business and good earnings so soon as its main line is put in operation.

The construction of the Western Pacific Ry. Co.'s line is now a certainty, and its completion within the next three years is confidently anticipated.

The Pacific Coast traffic is already very large and is rapidly growing. In view of the greatly increased volume of this traffic that will be carried over your existing lines so soon as the new railway is completed, and in view also of the advantages to be derived from the development of local industries and the opening up of additional markets, the importance and value of this new artery of commerce to your system of railway and to your Utah Fuel Co. can hardly be overestimated.

Your Board of Directors have great confidence in the advantages which this transaction will bring to your property, and this confidence is the result of the most careful investigation and consideration, extending over several years, and is based upon the commercial growth of the country, and especially upon the marvelous richness and development of the great Pacific Coast territory and of the foreign trade tributary thereto.

PERSONAL NOTES.

Mr. E. H. Randall has been elected city engineer of Fredericksburg, Va.

Mr. G. P. Troutman, asistant division engineer, Lehigh Valley R. R., Centralia, Pa., has resigned that position.

Mr. E. H. Phafflin has succeeded Mr. F. W. Ranno as engineer of maintenance of way and structures of the Southern Indiana.

Mr. H. F. Stratton has been appointed New York representative of the Electrical Controller & Supply Co., with offices at 136 Liberty St.

Mr. C. L. Barnaby, of the Grand Rapids & Indiana Ry., has been promoted to the position of division engineer of maintenance of way at Fort Wayne.

Mr. Chas. E. Steiner, assistant engineer, U. S. Reclamation Service, has been transferred from the Denver office to duty on the Pathfinder dam, in Wyoming.

Mr. Charles H. Pierce has been appointed instructor in theoretical and applied mechanics at the University of Illinois.

Mr. Samuel M. Gray, of Providence, has been retained as consulting engineer on the new water filtration works to be built at Troy, N. Y.

Mr. H. W. Church, division engineer of the Chicago Great Western Ry. at St. Paul, has resigned to enter private busines. He will be succeeded by Mr. E. M. Grime.

Mr. F. W. Hawks, chief engineer of the Evansville & Terre Haute R. R., has resigned to join the Chicago & Eastern Illinois R. R., and his duties will be assumed by Mr. J. O. Crockett, superintendent.

Mr. S. Lee Thompson, formerly with the Milwaukee Railroad & Electric Light Co., has been appointed superintendent of motive power of the Indiana Union Traction Co., and Mr. Guy S. Kelsay electrical engineer.

Mr. Walter H. Whiteside has been elected president of the Allis-Chalmers Co. and Mr. Henry Woodland treasurer. Mr. W. S. Doran has been appointed manager of the power department.

Messrs. W. E. Dauchy, division engineer, Isthmian Canal Commission, and C. H. Strom, mechanical engineer, returned to the United States this week on leave of absence.

Capt. Edward H. Schulz, Corps of Engineers, U. S. A., has received from the Military Service Institution the Hunt prize for 1905, for a paper on the land defense of sea-coast fortifications.

Mr. Irving A. Chandler has moved his office from 1 Broadway to 120 Liberty St., New York, where he will continue his work in power plant, water works and industrial plant engineering.

Mr. Herbert Smith has been made general superintendent of the National Wire Co. and the National Steel Foundry Co., two New Haven companies. It is understood that several new buildings will be erected by these companies, which are closely identified.

Mr. C. H. Neimeyer has been appointed assistant engineer of the Pennsylvania R. R. in Sunbury, succeeding A. E. Fillebrown, whose death was announced last week. Mr. Neimeyer has been promoted to his new position from that of supervisor on the Pittsburg division.

Mr. R. E. Dougherty has been appointed resident engineer, N. Y. C. & H. R. R. R., in charge of construction in the Exterior Zone south of Poughkeepsie on the main line, Newburgh on the West Shore, Putnam Junction on the Harlem and the whole Putnam R. R.

Mr. F. C. Noble has been promoted to the position of engineer of the fifth division of the New York Rapid Transit R. R. Commission, with offices at 4 Court Square, Brooklyn. He succeeds Mr. Robert Ridgway, who has resigned to join the engineering staff of the New York Board of Water Supply.

At the convention of the American Society of Municipal Improvements at Montreal last week, Mr. C. C. Brown, of Indianapolis, was elected president, Mr. John R. Barlow, of Montreal, Mr. James Owen, of Montclair, N. J., and Mr. Julian Kendrick, of Birmingham, Ala., vice-presidents, Mr. George W. Tillson, of Brooklyn, secretary, and Mr. F. J. O'Brien, of Oswego, treasurer.

Mr. Douglas W. Taylor has been appointed city engineer of Portland, Ore. In 1868 he entered the Multnomah county surveyor's office, where he remained until 1870. From then until 1872 he engaged in railroad construction for the Southern Pacific. From 1872 to 1874 he was county surveyor, and from 1874 to 1878, and from 1881 to 1883, city engineer. During the years from 1886 to 1890 he was surveyor-general of Oregon, and from 1891 to 1893 he was superintendent of streets of Portland. Since that time he has engaged in the practice of his profession in a private capacity, and has been identified with some of the big corporations of the city and state.

Vernon H. Rood, vice-president and general manager of the Jeanesville Iron Works, Hazleton, Pa., died suddenly, Sept. 2 at Bad Naudheim, Germany, where he had gone for the benefit of his health three weeks ago. Mr. Rood was 48 years old. He was born in Elyria, O., in 1856, and was a son of the late Homer B. Rood. He was a graduate of the Stevens Institute of Technology. Shortly after his marriage in 1882 he located at Jeanesville. He was a prominent member of the American Society of Mechanical Engineers. For the past 15 years Mr. Rood has devoted his entire time and energy to the perfection of mine pumps and during that time he achieved a great deal of success. Not only did he bring the Jeanesville Iron Works from the position of a small local manufacturing plant into that of the largest makers of mine pumps in the anthracite fields, but his name as pump designer has spread to a world wide reputation and the business of his company is to-day an international one. Much as his sudden loss will mean to his profession it will be a greater and more poignant affliction to his host of friends.

Mr. James C. Hain has resigned as engineer of masonry construction for the Chicago, Milwaukee & St. Paul R. R., and is now associated with J. G. White & Co., as superintendent of masonry construction, with headquarters at 43 Exchange Place, New York. Mr. Hain graduated in 1893 from the University of Wisconsin, and the University conferred upon him the degree of C. E. this year. He was with the Chicago, Milwaukee & St. Paul Ry. for ten years and in that time gained a broad experience in the work which is supervised by its bridge and building department. While with this company he also had experience in general design and in detail computation and drawing. He also performed outside duties of surveying, collecting data, and other work relative to replacing wooden bridges and other temporary structures with permanent masonry construction. During the year 1900-01 he was in charge of the construction of the large ore dock and approaches at Escanaba, Mich. In 1901 he was appointed engineer of masonry construction and in that capacity supervised all work of this nature that has been done during the last four years by the company on its 7,000-mile system.

The offices of division engineers of the Choctaw district of the Rock Island system have been abolished and the entire district placed under a district engineer, Mr. H. G. Clark. He was formerly engineer of the Arkansas division, and hereafter his headquarters will be in Little Rock. He will report to the general superintendent. Messrs. A. S. Zinn and J. C. Breedlove, division engineers at Oklahoma City and Chickasha, have tendered their resignations. These changes are part of the program for the reorganization of the engineering department of the road, which will hereafter have a chief engineer, reporting to the second vice-president; such principal assistant engineers as may be necessary, reporting to the chief engineer; two engineers of maintenance of way, reporting to their respective general managers and to the chief engineer; four district engineers, reporting to their respective general superintendents and engineers of maintenance of way; such assistant engineers as may be necessary, reporting to the district engineers. In addition to Mr. Clark the new district engineers are Mr. J. M. Brown, Davenport, Ia.; Mr. G. Davis, Cedar Rapids, Ia.; and Mr. W. H. Davisson, Topeka, Kan.

Franz Reuleaux, whose death on Aug. 20 was briefly announced in this journal a few weeks ago, was born near Aachen on Sept. 30, 1829. In an old-fashioned machine shop run by his father and later in a shop at Coblenz, he received a good practical training and that acquaintance with the view-point of machinists which enabled him to accomplish some of his most ambitious literary undertakings. From 1850 to 1852 he was a student under Redtenbacher at Carlsruhe. He then spent two years at the Universities of Berlin and Bonn studying philosophy. In Bonn he started to write his famous "Konstruktionslehre für den Maschinenbau." After his studies were completed he worked for a short time for a shop in Cologne, which he left in order to cooperate with Zeuner in starting a course in mechanical engineering at the Zurich Polytechnic Institute, then in its infancy. Zeuner confined his attention mainly to power plant while Reuleaux took up machine design. He first reviewed the mathematical work of French authors and then explained its technical application, gradually constructing for this purpose a collection of models which have become famous among educational apparatus. In 1864 he was offered and declined the position of director of the Riga Polytechnic Institute. In 1868 he became director of the Berlin Industrial Academy, an office he held until the organization in 1879 of the great polytechnic school at Charlottenburg. He was a professor there until 1896. In addition to these educational duties, he was engaged in many technical investigations for government bureaus. His best known work, "Der Konstrukteur," has been translated into English by Mr. H. H. Supplee.

At the last meeting of the American Society of Civil Engineers the following candidates for admission were elected: As Members: E. W. Branch, Quincy, Mass.; A. S. Burgess, assistant engineer, Aqueduct Commission, New York; H. L. Cooper, chief hydraulic engineer, Electrical Development Co. of Ontario, New York; F. L. Davis, city engineer, Tacoma; C. E. Gordon, U. S. Reclamation Service, Lawton, Okla.; E. B. Gumaer, Jersey City, N. J.; D. E. Hughes, U. S. assistant engineer, San Pedro, Cal.; W. F. Kauffmann, assistant engineer, Erie R. R., East Rutherford, N. J.; R. S. Parsons, division engineer, maintenance of way, Cleveland; W. A. Pearson, Jr., chief engineer, General Electric Co., Schenectady, N. Y.; S. B. Robbins, U. S. Reclamation Service, Great Falls, Mont.; S. M. Russell, superintendent, Toledo, Peoria & Western Ry., Peoria, Ill.; E. H. Sapp, civil engineer, New York Shipbuilding Co., Camden, N. J.; F. E. Snyder, assistant engineer, Atchison, Topeka & Santa Fe Ry., Chicago; DeW. C. Webb, civil engineer, U. S. N., Philadelphia, Pa.; A. B. Wood, manager, Oregon Securities Co., Cottage Grove, Ore. As Associate Members: J. W. Ackerman, city engineer, Auburn, N. Y.; C. E. Alderman, with Norcross Bros. Co., Worcester; W. J. Boucher, assistant engineer, Rapid Transit Subway Construction Co., New York; W. L. Brown, resident engineer, Pa., N. Y. & L. I. R. R., New York; J. P. Carlin, managing director, P. J. Carlin Construction Co., New York; J. C. Clausen, U. S. Reclamation Service, Yuma, Ariz.; C. B. Grady, resident engineer, new Waterside Station, N. Y. Edison Co., New York; S. W. Henderson, engineer of construction, Animas Canal & Power Co., Durango, Colo.; E. E. Howard, with Waddell & Hedrick, Kansas City, Mo.; Adam Hunter, chief assistant engineer, Sir Wm. Arrol & Co., London; P. A. Kirchner, assistant engineer, Chesapeake & Ohio Ry., Richmond, Va.; J. H. Lewis, State engineer, Salem, Ore.; S. A. McCoy, division engineer, C., R. I. & P. Ry., Fordyce, Ark.; W. S. Manning, Jr., civil engineer, Solvay Process Co., Syracuse; C. A. Mees, civil engineer; Catawba Power Co., Charlotte, N. C.; W. H. Norris, assistant engineer, bridge department, Boston & Maine R. R., C. E. Quimby, chief engineer, Ludlow Mfg. Co., Ludlow, Mass.; A. W. Sargent, U. S. junior engineer, Fort Flagler, Wash.; W. C. Sawyer, U. S. Reclamation Service, Pendleton, Ore.; Prof. G. E. P. Smith, University of Arizona, Tucson; J. T. Stewart, drainage engineer, Dept. of Agriculture, Washington; John Stockton, with W. F. Whittemore, Hoboken; J. R. Taft, assistant engineer, N. Y. C. & H. R. R. R., New York. As Associate: James F. Wrenn, superintendent of construction, W. J. Oliver Co., Batesville, Ind. The following Associate Members were recently transferred to full membership by the Board of Direction: C. W. Comstock, Denver; J. W. Frazier, Cleveland; J. H. O'Brien, New York; Julian Thornley, Niagara Falls; O. H. Tripp, Rockland, Me.

BUSINESS NOTES.

The Robins Conveying Belt Co., 21 Park Row, New York, has recently secured an order from the Orlando Water & Light Co., Orlando, Fla., for a belt conveyor for handling wet muck. Among its other recent contracts are an order for a conveyor from the C. W. Hunt Co., West New Brighton, N. Y., and an order for five belt conveyors for the crushing plant of the Semet Solvay Co., Milwaukee, Wis.

The property of the Hecla Portland Cement & Coal Co. will again be offered for sale at the Court House in Bay City, on Sept. 27, at 2 p. m. It was offered at an upset price of $950,000 on June 7, and no bids were received. On June 18 it was offered at $750,000 upset price and again no bids were received. The sale on Sept. 27 will be made under the following conditions: All of the property will be offered as an entirety at an upset price of not less than $750,000. Thereafter, whether any bid for the property as an entirety be made or not, the property will be offered in parcels or groups of parcels, in such way and manner as in the judgment of the Master in Chancery shall be for the best interests of all parties, and as shall operate to secure the highest prices. The Master in Chancery is directed by the Court to divide the property into parcels or groups of parcels, and to file with the Clerk of the Court his report showing the division at least fifteen days before Sept. 27. This report will be open to the inspection of any persons desiring to become bidders. If there is no bid of $750,000 for the property as an entirety, or if the aggregate of the bids for the parsels or groups of parcels does not equal $750,000, the sale will be adjourned. Twenty per cent. of each bid must be deposited in money, or by certified check upon any bank or trust company, prior to the making of the bid.

CONTRACTING NEWS

OF SPECIAL INTEREST TO
CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS
OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

Dawson, Alaska.—It is reported that surveys are being made for a government water system from the upper Klondike River.

**Yuma, Ariz.*—J. B. Lippincott, Super. Engr., U. S. Reclamation Service, 1,108 Braly Bldg., Los Angeles, Cal., writes that the contract for construcing about 12 miles of dike for the reclamation of Yuma Valley, Ariz. (bids opened Aug. 17), has been awarded to Miller & Peasley, 223 Wilcox Bldg., Los Angeles, Cal., for the entire schedule, at $66,325. For detail bids received for this work, see issue of The Engineering Record Aug. 26.

Fayetteville, Ark.—The Council is said to be considering a plan to buy the city water works system and put in a complete sewerage system. The combined cost, it is stated, to be nearly $150,000.

Morrell, Ark.—J. M. Waddell, of Morrell, is the Engr. in charge of the proposed water works. The taking of the water from a deep well having a daily capacity of 200,000 gal., it is stated, is contemplated.

Fresno, Cal.—The Fresno Water Co. is reported to have decided to construct 2 pumping plants and purchase 27,000 ft. of pipe; probable cost of work, $22,000.

Sacramento, Cal.—The lowest bid recently received for constructing a new suction pipe for the water works is stated to have been submitted by Jas. Touhey for $14,995. It will probably be rejected.

**Turlock, Cal.*—Hedman & Olson, of Turlock, are stated to have secured the contract for the repair work on the irrigation canal for the Turlock Irrigation Dist. (John L. Brown, Secy.) for about $13,000.

Los Angeles, Cal.—The citizens have voted in favor of issuing bonds to bring the Owens River to this city in a conduit 240 miles long, the cost to be about $21,000,000.

Red Bluff, Cal.—F. W. Decker, Town Clk., writes that the town is arranging for arbitration as to value of the private water works, with intention of purchasing same.

Canon City, Colo.—The Greenhorn Artesian Water Co. (A. C. Dickinson, Secy.), it is stated, has been incorporated for the purpose of furnishing water to the towns of South Canon, Lincoln Park and the suburbs of the south side. It is said to be the purpose of the company to install meters.

Boulder, Colo.—Bids will be received by Eugene Wilder, City Clk., until Oct. 18 for furnishing material and installing a system of mountain water mains, as advertised in The Engineering Record.

Danbury, Conn.—Bids will be received by the Water Com. until Sept. 25 for the construction of a reservoir, dam, forebay and pipe line, as advertised in The Engineering Record.

Wilmington, Del.—Theo. A. Leisen, Ch. Engr. Bureau of Water, it is stated, has been instructed to prepare plans for the construction of a preliminary filtration plant. Probable cost, $40,000.

*The contract for constructing a 35,000,000-gal. reservoir (bids opened Sept. 4) has been awarded to Jere. T. Finch, of Glenns Falls, N. Y., for $161,115.

Jackson, Ga.—See "Power Plants, Gas and Electricity."

Tifton, Ga.—The City Council, it is stated, has adopted a resolution to call an election at the earliest possible date to vote on the question of issuing $50,000 bonds, $20,000 to be used to erect a school, and $30,000 for the installing of a water system.

**Chicago, Ill.*—The contract for furnishing and constructing about 28 lin. ft. of 5-ft. tunnel, including bulkheads, etc., at the Chicago Ave. Pumping Station (bids received Sept. 6) has been awarded to Thos. Osborn, Chamber of Commerce Bldg., at $1,380.

Chicago, Ill.—Bids will be received by the Dept. Pub. Wks. (J. M. Patterson, Comr.) until Sept. 30 for furnishing and delivering about 221 pieces 36-in. c.-i. water pipe; also about 336 pieces 16-in. c.-i. water pipe.

Bids will be received until Oct. 4 by the Dept. Pub. Wks. (J. M. Patterson, Comr. Pub. Wks.) for furnishing and erecting in the boiler room of the Lake View pumping station, four 250-hp. internally fired horizontal return tubular boilers, fitted with furnaces and necessary appurtenances.

Lanesville, Ind.—Bids will be received until Sept. 25 by the Lanesville Water Works Co., at the post office (Louis P. Zabel, Postmaster) for constructing water works.

Columbus, Ind.—Bids will be received until Sept. 21 by Geo. Vorwald, City Clk., for constructing a wooden filtration gallery, 3+8+200 ft., in White River.

**Marion, Ind.*—The bids opened Sept. 5 by the Bd. Pub. Wks. for constructing a 2,000,000-gal. reservoir were as follows: (F. E. Petrie, City Engr.): Bidders all of Marion: W. W. C. Barnes, $10,400 (awarded contract); L. C. Lillard, $11,245; C. W. Barley, $12,187, and Pasco Peele, $11,450. The work includes the following: 9,500 cu. yds. excav. loom, clay, sand and gravel; 700 cu. yds. gravel concrete; 85 cu. yds. cement mortar; 310,000 hard burned brick; 150 ft. 16-in. and 230 ft. 12-in. pipe, to be laid, and 1 manhole.

Tulsa, Ind. Ter.—See "Power Plants, Gas and Electricity."

Tulsa, Ind. Ter.—It is stated that about $40,000 will be expended on the water works of this city of which Geo. G. Bayne is the owner. N. J. Gubser is City Recorder.

**Charles City, Ia.*—The Marsh Bridge Co., of Des Moines, it is stated, has secured the contract to construct the reservoir at $3,842.

Ames, Ia.—The following are the totals of the bids received Sept. 4 for constructing an extension to the water works system (A. Marston, Engr., Ames.): Des Moines Bridge & Iron Co., Des Moines, Ia., $32,690; W. D. Lovell, St. Paul, Minn., $34,015, not including well; Dwyer Plumbing & Heating Co., St. Paul, Minn., $35,200; American Light & Water Co., Kansas City, $35,952; Symms Power Co., Sioux Falls, S. D., $36,658, and J. Martin Healey, Chicago, Ill., $36,700. Separate bids for the water tower were received as follows: Kenwood Bridge Co., Chicago, Ill., $5,200; Chicago Bridge & Iron Co., Chicago, Ill., $5,300, and American Bridge Co., Chicago, Ill., $5,300.

The itemized bids of the Des Moines Bridge & Iron Co. (the lowest bidder) on some of the materials required was as follows: c.-i. water main laid, 397 ft. 12-in., $1.85; 220 ft. 10-in., $1.50; 1,317 ft. 8-in., $1.11; 7,522 ft. 6-in., 86 cts.; 15,475 ft. 4-in., 57 cts., and 2,700 ft. 1¼-in. W. I. or steel, 25 cts.; a steel tank of 60,000 gal. capacity, on a steel water tower 80 ft. high, $5,193; concrete surface reservoir of about 100,000 gal. capacity, (*a*) main reservoir complete $1,703 (*b*) aerator, $495; 10-in. cased well about 125 ft. deep, $375; electric deep well pumping plant, $1,290; 1,000 gal. per minute underwriters' fire pump, $1,226, and 19x45 ft. addition to main pumping station, $1,815.

Topeka, Kan.—It is reported that the Bd. Water Comrs. have decided to extend the water mains into the 5th Ward.

**Princeton, Ky.*—J. N. Brewer, City Clk., writes that T. C. Brooks & Sons, of Jackson, Mich., have secured the contract for furnishing material and constructing water works (bids opened Sept. 5) for $29,655, to be completed Jan. 1st, 1906.

**Smith's Grove, Ky.*—Sam E. Ellis, of Bowling Green, is reported to have secured the contract for constructing the water works at Smith's Grove.

Yarmouth, Me.—C. L. Bucknam, Chmn. Bd. of Selectmen, writes under date of Sept. 12 that owing to a delay in plans and specifications, contract for the water works extension was not let on Sept. 5. The citizens recently voted to appropriate $25,000 for installing new system of mains, etc.

**Bar Harbor, Me.*—The contract for the hauling of sand and construction work on the filter plant of the Bar Harbor Water Co., it is stated, has been awarded to Strout & Willey. It is reported that the cost will be about $35,000.

Oakland, Md.—The Council is reported to have granted a franchise for water works and a sewerage system to L. T. Yoder, of Pittsburg, Pa.

Russell, Mass.—At a town meeting, held Sept. 2, it was decided, according to press reports, to abandon the idea for the present of constructing a water system.

Waltham, Mass.—The Water Works Com. is stated to have recommended that the Bd. of Aldermen appropriate $27,000 for an increased water supply and $37,000 to preserve the purity and increase the pressure of the water.

Hancock, Mich.—The Bd. of Pub. Wks. is reported to have decided to recommend to the Council the construction of a 1,000,000-gal. reservoir on Quincy Hill, to supply West Hancock.

Saginaw, Mich.—Rolla W. Roberts, City Engr., writes that the question of a better water supply is under consideration by the Bd. of Water Comrs. The question of filtering the present river water is being discussed. A supply of from fifteen to eighteen million gallons in 24 hours will be required.

Brainerd, Minn.—It is reported that the City Engineer will prepare estimates for water works.

**Glenwood, Minn.*—W. C. Fraser, of Rochester, is stated to have secured the contract for constructing water works, for $3,500.

**South St. Paul, Minn.*—W. I. Gray, of Minneapolis, it is stated, have received the contract for 2,636 ft. of water main at $2,886.

Thief River Falls, Minn.—Bids will be received until Oct. 3 by Lars Backe, City Clk., for $25,000 bonds, to construct water works.

New Ulm, Minn.—It is stated that the Council is considering the advisability of extending the water mains.

Biwabik, Minn.—The village is said to be considering the installation of water works and sewerage.

**Barnesville, Minn.*—Pastoret & Luriz, of Two Harbors, are stated to have secured the contract for constructing water works (bids opened Sept. 1) for $38,900.

Boyd, Minn.—Bids will be received by the Village Bd. of Trus. until Sept. 26 for the construction of a complete system of water works, both compressed air and gravity system. Oscar Claussen, Consulting Engr., Nat'l German American Bank Bldg., St. Paul.

Wesson, Miss.—An election will soon be held to vote on issuing $20,000 bonds for water works.

Rolla, Mo.—Plans and specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for the construction of water works, bids for which will be received until Oct. 16, as advertised in The Engineering Record.

Glendive, Mont.—Bids will be received until Dec. 5 by the U. S. Reclamation Service at Billings, Mont., for constructing the Lower Yellowstone dam, a rock-filled, timber-cribbed structure, requiring about 500,000 ft. of lumber, 700 piles, 1,600 sheet piles, 11,000 cu. yds. rock filling, and rip rap, and 100 tons of steel, located about 18 miles northeast of Glendive, as advertised in The Engineering Record.

**Norfolk, Neb.*—Julius Holff, City Clk., writes that the contract for extending water mains (bids opened Sept. 7) has been awarded to O. W. Rish of Norfolk, for $2,245.

Bassett, Neb.—W. T. Phillips, City Clk., writes that it is proposed to construct water works, at a cost of $8,000.

Orange, N. J.—The Common Council is reported to have under consideration the plans of City Engr. Fred. T. Crane for a new water distributing system; according to the estimate about 8,000 ft. of 20-in. main would be needed to connect Campbells Pond with the new reservoir and about 19,000 ft. of 24 or 30-in. pipe for the main leading into city; probable cost from $171,000 to $200,000.

Cranbury, N. J.—Bids will be received until Sept. 25 for the construction of water works, as advertised in The Engineering Record.

Garfield, N. J.—Bids will be received until Sept. 20 for the construction of a reinforced concrete reservoir, as advertised in The Engineering Record.

Brooklyn, N. Y.—The following are the totals of the bids received Sept. 6 by John T. Oakley, Comr. Water Supply, Gas and Electricity, N. Y. City. for hauling and laying water mains and appurtenances in the Boro. Brooklyn: F. N. Lewis, $42,917; I. Harris, 485 Flatbush Ave., $26,136, and Dan Douglas, $38,720. The itemized bid of the lowest bidder on some of the materials is as follows: Pipe, including excav. and filling, 4,800 lin. ft. 20-in., 40 cts.; 4,000 lin. ft. 16-in., 40 cts.; 12,000 lin. ft. 12-in., 35 cts.; 30,000 lin. ft. 8-in., 28 cts., and 2,500 lin. ft. 8-in., 22 cts.; 1,200 cu. yds. extra excav., 50 cts.; 100 cu. yds. rock excav., 1 ct.; 1,000 sq. yds. asphalt pavt., on concrete found., $3.50.

Bids were opened same time and place for furnishing, erecting and connecting 2 pumping engines, including foundation, etc., at New Lots Pumping Station, Brooklyn Boro., were as follows: Allis-Chalmers Co., Milwaukee, Wis., $47,000; Snow Steam Pump Works., 114 Liberty St., N. Y. City, $48,700, and Marine Engine & Machine Co., 1123 Bway, N. Y. City, $39,500.

Bids were opened same time and place as follows for furnishing and erecting 2 brick chimneys at the new Ridgewood Pumping Station, Boro. Brooklyn: Jas. McArthur, 22 Ormond Pl., $12,473; Borough Constr. Co., 44 Court St., $11,200; H. Hennecker, $8,485, and A. Custodis Chimney Constr. Co., 95 Nassau St., N. Y. City, $9,195.

Brooklyn, N. Y.—Bids were opened Sept. 6 by John T. Oakley, Comr. Water Supply, Gas and Electricity, N. Y. City, as follows: For furnishing, delivering and laying water mains and removing existing water mains in Wythe and Franklin Aves. and several other streets in Boro. of Brooklyn: (*a*) I. Harris, 485 Flatbush Ave., $90,492, and (*b*) Thos. O. C. Sloane, $69,072. The itemized bids on some of the material is as follows:

	a	*b*
930 tons straight c.-i. pipe	$27.00	$29.00
100 tons c. i. specials	60.00	56.00
15,900 lin. ft. 12-in. pipe, to be laid	1.00	.29
13,100 lin. ft. 8-in. pipe, to be laid	1.00	.25
1,600 lin. ft. 6-in. pipe, to be laid	.40	.20
5,800 sq. yds. block pavt., relaid	.30	.46
3,000 sq. yds. block pavt., relaid	2.00	2.00
10 M. ft. lumber	30.00	25.00
24,000 lin. ft. 6-in. pipe, removed	.03	.01
1 12-in. wet connection to 36-in. pipe	225.00	150.00

**Ft. Plain, N. Y.*—The following are stated to be the bids opened Sept. 1 by the Bd. Trus. for deepening and walling up the reservoir: Jacob Snell & Co., Fonda, $8,800 (awarded contract); A. L. Norton, Albany, $12,816, and Fred. Schuyler, Ft. Plain, $12,316.

Lakewood, N. Y.—Engr. C. G. Jones, of Jamestown, writes that the proposed water works for Lakewood will cost about $30,000.

Albany, N. Y.—Plans are being prepared for a pumping engine for the water works, to have a pumping capacity of 10,000,000 gals. daily and to be of triple-expansion crank and flywheel type. Plans are also being prepared for 4 filter beds, but it is not expected that the plans will be completed on the beds in time to commence work this winter.

Troy, N. Y.—Water bonds, amounting to $181,500, it is reported, have been sold.

Troy, N. Y.—Saml. M. Gray, of Providence, R. I., is reported to have been appointed as Consulting Engr. for the new water works.

**Fargo, N. D.*—C. H. Porritt has secured the contract for 4,720 ft. 6-in. water main at 97 cts. per ft. and for 3,953 ft. of 12-in. sewer pipe in various lengths at 99 cts. and 94 cts. per ft. respectively, manholes $41 and catch basin, ea. $49.25.

**Lorain, O.*—The Pittsburg Filter Mfg. Co., of Pittsburg, Pa., is reported to have secured the contract for furnishing this city with water filters.

Cincinnati, O.—Bids will be received until Oct. 13 by the Bd. Trus., Comrs. Water Works (Aug. Herrmann, Pres.) for laying c.-i. pipe and special castings and valves, etc., under and across Mill Creek, for the extension of the water distribution system.

Reading, O.—Bids will be received until Sept. 25 by the Trus. Bd. Pub. Affairs (F. H. Vorjohn, Pres.) for about 80 tons of 4-in. c.-i. water pipe, and 2 tons of c.-i. special castings, for the extension of the water mains; bidders to state price per ton of 2,000 lbs. f. o. b. cars at Reading.

Newark, O.—Bids will be received until Sept. 30 by the Bd. Pub. Service, for furnishing material and constructing water works, as advertised in The Engineering Record. Specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y.

Plymouth, O.—See "Power Plants, Gas and Electricity."

Items marked thus give the names of parties awarded contracts.

Portland, Ore.—Bids will be received by the Water Board until Oct. 11 for the construction of a high service main from Reservoir No. 1, Mt. Tabor, to a connection with the present mains at Killingsworth Ave. and Commercial St., a total distance of 39,500 ft.; also same date for furnishing and delivering at Portland, c.-i. water pipe and special castings, both proposals advertised in The Engineering Record.

**Columbia, Pa.*—The Smedley Constr. Co., of Philadelphia, Pa., it is stated, has secured the contract to construct a reservoir in Lockard's Hollow for the Columbia Water Co. (bids received Sept. 5). The specifications, it is stated, call for a concrete dam at upper end of reservoir to be 125 ft. long, 17 ft. high, 10 ft. at bottom and 4 ft. at top. The reservoir will be surrounded by a concrete coping and a concrete channel to carry off storm water. In reservoir will be constructed 148 concrete and brick piers surmounted by iron columns varying in height from 6 ft. to 20 ft. to support roof to be erected by the company in the spring. The roof to contain 45,000 sq. ft. of corrugated iron. The capacity of the reservoir is 5,000,000 gals.

Wampum, Pa.—C. W. Miller, Burgess, writes that the citizens voted Sept. 12 to issue $12,000 bonds for constructing a gravity system of water works.

Homestead, Pa.—Bids will be received until Oct. 2 by And. Hill, Clk. Council, for furnishing and installing a 150-hp. tubular boiler, with steel stack and foundations complete in the borough's water works.

New Castle, Pa.—The Baltimore & Ohio R. R. Co. (D. D. Carothers, Ch. Engr., Baltimore, Md.) and the Pittsburg & Lake Erie R. R. Co. (J. A. Atwood, Ch. Engr., Pittsburg) are reported to be considering the question of constructing jointly a water purifying plant near New Castle.

Philadelphia, Pa.—The following are reported to be the bids opened on Sept. 6 by A. Lincoln Acker, Dir. Dept. Pub. Wks., for about 200,000 cu. yds. filtering materials and collectors for the Torresdale plant; about 26,654 lin. ft. of terra cotta pipe was also bid upon: (*a*) gravel No. 1, per cu. yd.; (*b*) sand, per cu. yd., and (*c*) total, including terra cotta pipe. Norcross & Edmunds also submitted an alternate bid at $302,936.

	a	*b*	*c*
Pepper & Bowie, Land Title Bldg.	$1.85	$1.65	$310,996
J. H. Louchheim	2.56	1.64	328,194
Norcross & Edmunds	2.73	1.68	336,589
West, Newcomb & Co.	3.11	1.91	383,378
John J. Torpey & Co.	4.00	2.50	471.093
N. Y. & Pa. Sand. Co.	3.76	1.90	652,094
David Peoples	3.60	3.60	657,543

New York, N. Y.—The following are the bids received Sept. 6 by John T. Oakley, Comr. Water Supply and Electricity for furnishing and laying water-mains in Morningside Ave. W., Ave. A and Emerson, 14th and 202 Sts. and several other streets in Boroughs of Manhattan and Bronx: (*a*) Clinton Beckwith, (*b*) Gallo & Pitelli, 127 Mulberry St., (*c*) Jno. Cornwell, (*d*) Louis D. Gregory, (*e*) Cunningham & Kearnes, (*f*) Jos. Burns:

	a	*b*	*c*	*d*	*e*	*f*
1,530 tons straight pipe	$26.75	$32.00	$29.00	$34.00	$27.50	$28.75
51 tons branches and special castings	58.00	65.00	60.00	70.00	62.00	60.00
20 cu. yds. rock excav. without blasting	10.00	8.00	10.00	10.00	5.00	5.00
2,000 cu. yds. rock excav	3.00	3.00	2.00	3.00	.40	.38
23,000 cu. yds. earth excav	.27	.35	.30	.40	.40	.38
25,200 cu. yds. filling	.23	.15	.16	.30	.40	.38
Pipe laid—						
2,200 lin. ft. 20-in.	.45	.30	.70	.60	.58	.50
24,200 lin. ft. 12-in	.30	.20	.44	.30	.35	.35
14,500 lin. ft. 6-in	.18	.16	.22	.20	.19	.20
Connections—						
2 36 x 12-in.	175.00	200.00	350.00	200.00	200.00	300.00
1 20 x 12-in.	90.00	150.00	200.00	120.00	100.00	200.00
1 20 x 6-in.	60.00	150.00	150.00	100.00	100.00	150.00
4,000 sq. yds. asphalt pavt. relaid	3.75	1.23	3.00	4.00	3.50	4.00
1,650 sq. yds. granite pavt. relaid	2.00	1.00	1.50	1.50	2.00	2.00
Totals	$113,029	$110,845	$126,899	$133,091	$118,887	$121,985

New York, N. Y.—The following are the bids opened Sept. 6 by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing and laying water mains, including stop cocks and boxes, in Ann, Beekman, Cedar and other streets in the Boroughs of Manhattan and Bronx: (*a*) John Cornwell, 69 E. 127th St.; (*b*) Cunningham & Kearns, 438 E. 91st St.; (*c*) Louis D. Gregory, 125th St. and First Ave.:

	a	*b*	*c*
1,800 tons straight pipe	$30.00	$27.50	$36.00
105 tons branches and special castings	70.00	62.00	70.00
100 cu. yds. rock excav., without blasting	10.00	5.00	.01
700 cu. yds. rock excav	5.00	.40	.01
2,100 cu. yds. masonry excav., without blasting	.60	.40	2.00
29,000 cu. yds. earth excav	.60	.40	.60
29,300 cu. yds. filling	.40	.40	.35
36,000 lin. ft. 12-in. pipe, laid	.50	.40	.35
10,700 lin. ft. 6-in. pipe, laid	.30	.20	.17
8 20 x 12-in. connections	175.00	100.00	120.00
7 16 x 12-in. connections	160.00	100.00	100.00
3,160 sq. yds. sheet or rock asphalt pavt., etc., relaid	4.50	4.25	4.30
8,550 sq. yds. granite block pavt., etc., relaid	1.50	2.00	1.80
Totals	$195,137	$169,625	$187,642

Cody, Wyo.—H. N. Savage, Superv. Engr., U. S. Reclamation Service, Billings, Mont., writes that the following are the bids opened Sept. 6 at the office of the U. S. Reclamation Service, Billings, Mont., for the construction of a tunnel approximately 18,000 ft. long and auxiliary works, located about 10 miles east of Cody, to be known as the Corbett Tunnel, Shoshone Project, Wyo.: (*a*) Chas. Spear, Billings, Mont.; (*b*) J. G. White & Co., New York, N. Y.; (*c*) Patk. McDonnell, Duluth, Minn.; (*d*) W. C. Bradbury, Denver, Colo.; (*e*) Rod. D. Leggate, Butte, Mont.:

	a	*b*	*c*	*d*	*e*
17,000 lin. ft. tunnel, including lining	$33.00	$33.60	$34.00	$39.75	$45.00
28,000 cu. yds. open cut excav.	.50	.39	.60	.25	.25
500 cu. yds. dry rock paving in place	3.00	3.20	5.00	2.00	2.25
250 cu. yds. gravel fill. under rock paving	1.50	.40	1.00	.75	1.00
400 cu. yds. concrete in portals	7.00	7.80	6.00	6.00	8.00
19,000 cu. yds. placing material in embnkt	.35	.45	.40	.30	.30
250 lin. ft. sluicing tunnel, lined	20.00	10.30	30.00	23.00	22.00
Shaft, pipe, gate and gate house on sluicing tunnel, lump sum	3000.00	1685.00	5000.00	2250.00	3000.00
Total	$594,325	$599,750	$620,050	$700,537	$790,775

Cody, Wyo.—H. N. Savage, of Billings, Mont., Superv. Engr. U. S. Reclamation Service, writes that the following are the bids opened at Billings on Sept. 5 for the construction of the Shoshone dam, spillway, outlet and road tunnels, located 8 miles west of Cody: (*a*) Prendergast & Clarkson, Chicago, Ill.; (*b*) Patk. McDonnell, Duluth, Minn.; (*c*) Chas. Spear, Billings, Mont.; (*d*) W. C. Bradbury, Denver, Colo.:

	a	*b*	*c*	*d*
19,000 cu. yds. concrete—base of dam	$4.75	$4.25	$7.50	$7.25
50,000 cu. yds. concrete—portion of dam above base	4.00	4.25	5.75	6.25
480 lin. ft. outlet tunnel	36.00	50.00	30.00	56.00
Temporary diverting works (lump sum)	37,000.00	60,000.00	45,000.00	48,000.00
32,000 cu. yds. excav. for found. of dam, class 1	1.60	3.25	2.00	4.50
3,000 cu. yds. excav. for found. of dam, class 2	2.50	3.50	2.00	5.00
1,000 cu. yds. excav. for found. of dam, class 3	3.50	3.50	2.00	8.00
6,000 cu. yds. excav. for found. for dam, class 4	2.00	3.50	2.00	4.00
28,000 cu. yds. spillway, open-cut excav	1.95	1.25	1.20	1.30
7,000 cu. yds. spillway, tunnel excav	5.50	9.00	2.50	4.40
150 lin. ft. road tunnel	26.00	40.00	18.00	27.00
Total	$515,730	$620,250	$627,200	$787,380

**Salt Lake City, Utah.*—The following are the bids opened on Sept. 4 by the Bd. of Pub. Wks. (Geo. W. Riter, City Engr.) for constructing a reinforced concrete conduit to be known as the Big Cottonwood conduit, together with dividing station, and other appurtenances: (*a*) Gaffy—Keeffe Constr. Co.; (*b*) R. S. Blome Co.; (*c*) Snow, Clement & Strange; (*d*) Lynn S. Atkinson; (*e*) D. B. Brinton (bid informal); (*f*) P. J. Moran (awarded contract).

	a	*b*	*c*	*d*	*e*	**f*
45,000 cu. yds. earth excav	$1.50	$1.55	$0.88	$1.50	$0.70	$0.80
6,000 cu. yds. rock excav	2.00	3.00	2.75	5.00	2.00	4.95
1,700 lin. ft. earth tunnel	9.00	3.00	7.50	20.00	3.00	4.25
350 lin. ft. rock tunnel	25.00	8.00	14.90	24.00	20.00	11.00
13,000 cu. yds. concrete	17.20	14.00	17.25	10.00	13.50	10.75
40,000 sq. yds. grout	25	13½	07½	.04	30	15½
200 cu. yds. brick masonry	15.00	18.00	25.00	15.00	15.00	18.50
250,000 lbs. reinforcement	.01	.01¼	.03	.02	.03	.03½
20,000 lbs. iron and steel work (to set)	.01	.01	.03	.01	.04	.07
Total	$342,850	$289,975	$314,415	$279,700	$254,400	$236,576

Toledo, O.—Bids will be received until Oct. 10 by the Bd. Pub. Service for the construction of the water purification works, being Contract No. 4, including the construction of all basins, buildings, piping and appurtenances, as advertised in The Engineering Record.

Erie, Pa.—The following are the bids opened on Sept. 2 by the Comrs. of Water Wks. for constructing a chimney at the water works pumping station: (*a*) common brick; (*b*) perforated brick; (*c*) concrete: W. R. Casper, Erie, *a* $9,352; Depinet Bros., Erie, *a* $10,306; Donnelly & Jones, Erie, *a* $11,132; M. W. Kellogg & Co., New York, N. Y., *b* $5,343; Royce & Ricketts, Washington, D. C., *b* $8,000; Alphons Custodis Contr. Co., New York, N. Y., *b* $6,400; Meckle Milnor Engr. Co., Philadelphia, *b* $5,925 (deduct $700 if lining is only built 50 ft. high); O. S. Riblet, Erie, *c* (2 bids) $5,600 (12 in. thick), and $4,500 (8 in. thick); Weber Steel Concrete Chimney Co., Chicago, Ill., *c* $5,150.

Bamberg, S. C.—See "Power Plants, Gas and Electricity."

Belle Fourche, S. D.—Plans and specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for the construction of an earthen dam and appurtenances and 17½ miles of canals, located about 12 miles N. E. from Belle Fourche, S. D., as advertised in The Engineering Record.

Chattanooga, Tenn.—The City Water Co., it is stated, has been petitioned to extend its mains to Rossville.

Floresville, Tex.—Engineer M. Griffin O'Neil, of Dallas, writes that bids will be received on Sept. 28 for material only for the proposed water works, to consist of a boiler, pump, water tower, air compressor and feed-water heater.

For further information of the above, see advertisement in The Engineering Record.

Murray, Utah.—The City Council, it is stated, has passed an ordinance granting to J. P. Cahoon a franchise to install and operate a water works system.

Pleasant Grove, Utah.—Saml. H. Smith, City Recorder, writes that the citizens voted Aug. 15 to issue $9,900 bonds, for the construction of water works. Engineers, Lyman & Wilson, of Salt Lake City.

Monroe, Utah.—Wm. A. Warnock, Town Clk., writes that the citizens voted Aug. 28 to issue bonds for water works; Engineer, F. C. Kelsey, of Salt Lake City.

Burlington, Vt.—It is reported that Dr. J. B. Wheeler is Chmn. of a Com. which has charge of the preparing of plans for a filter system.

Blaine, Wash.—Young & Jenkins, successors to the North West Water Co. (J. S. Crilly, Supt.) intend enlarging the reservoir.

La Crosse, Wis.—Gen. A. MacKenzie, Corps Engrs., U. S. A., Washington, D. C., is reported is conferring with Capt. W. A. Thompson concerning the proposed establishment of reservoirs in the lowlands and swamps along the river where the backwater can be controlled and let into the channel as the stage of water demands it.

West Allis, Wis.—It is stated that bids are soon to be asked for constructing a pumping station, the plans for which are now nearing completion.

**Casper, Wyo.*—Geddis & Seerie Stone Co., Denver, Colo., secured the contract to construct Pathfinder dam, 50 miles south of Casper (bids received Aug. 16) at $482,000. For list of bids received for this work see The Engineering Record of Aug. 26.

Ciudad Juarez, Mex.—Bids will be received until Oct. 24 by S. Montemayor, Mayor, for furnishing materials and constructing a water works system for this city; probable cost, $65,000.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Fayetteville, Ark.—See "Water."

Bisbee, Ariz.—No details have as yet been settled with regard to the sewer system which it is proposed constructing here.

Plainville, Conn.—There is some talk here of constructing a sewerage system.

Washington, D. C.—Bids will be received until Sept. 25 by the Comrs. D. C., for furnishing and delivering 2 sluice gates 60-in. diameter, at the Sewerage Pumping Station, as advertised in The Engineering Record.

The following are the bids received Sept. 7 by the Comrs. D. C. for constructing sewers in the Dist. of Columbia: Jas. A. Coyle, sewer "A," 925 ft. 24-in., $2,526; T. Connelly Constr. Co., sewer "B," 1,620 ft. 15 to 21-in., $4,007; sewer "C," 740 ft. 15 and 18-in., $1,414; sewer "D," 420 ft. 24-in., $1,099; sewer "E," 500 ft. 21 and 24-in., $1,227, and sewer "F," 640 ft. 15 to 24-in., $1,975.

The following are the bids opened Sept. 11 for the construction of outfall of sewage disposal system: (*a*) 22,500 cu. yds. excav. in river bed, (*b*) 1,500 lin. ft. 60-in. iron pipe laid in river bed, (*c*) total, J. H. Lochheim, *a* 58 cts. *b* $15.42, *c* $36,180. Hiram W. Phillips, *a* 60 cts., *b* $20, *c* $43,500. D. E. McComb, Supt. of Sewers.

Marianna, Fla.—The city is reported to have decided to issue bonds for the construction of a sewerage system.

Tifton, Ga.—The question of installing a sewerage system is reported under consideration.

Vermillion, Tex.—Bids will be received until Oct. 2 by the City Council, for constructing a sewer in a portion of Willow St., C. I. Vaughn, City Aud.

Orange, Tex.—It is reported that a company is about to be formed for the purpose of combining the water works and sewerage plants in one and installing a new sewerage system. Col. W. D. Bettis, Secy. Progressive League, it is stated, may be able to give further information.

***Items marked thus give the names of parties awarded contracts.**

Batavia, Ill.—It is stated that plans have been adopted for a complete sewerage system on the west side, and bids for construction, it is reported, will be asked immediately. Estimated cost, $80,000.

Chicago, Ill.—The following are reported to be the bids opened on Sept. 6 for constructing the sewer in 95th St. The plans contemplate 15 miles of sewer, ranging from 3 to 10½ ft. in diameter, and include the erection of a pumping station at Erie Ave. and 95th St.: Nash Bros., $917,875 and Conway and Co., $855,880.

Belleville, Ill.—L. L. Harper, City Engr., is preparing plans and specifications for the construction this year of about 10 miles of sewers.

**East Moline, Ill.*—W. N. Dearborn, of Stone City, Ia., is stated to have secured the contract to construct the sewerage system here, for $20,900.

Crete, Ind.—It is reported that bids will be received until Sept. 29 by the Bd. Co. Comrs. (Alonzo G. Wright, Chmn.) at Winchester, for constructing 9,000 ft. 10 and 24-in. tile sewer, near Crete.

Riverside, Ind.—The Town Bd. is reported to have decided to construct sewers either this fall or early in the spring at a cost of $5,000.

Indianapolis, Ind.—Bids will be received until Sept. 25 by the Bd. Pub. Wks. (M. A. Downing, Pres.) for constructing a 24-in. pipe sewer in a portion of Meridian St.

Princeton, Ind.—It is reported that plans are being prepared for a sewer system. H. E. Taylor, Clk. Com.

**Franklin, Ind.*—The City Council, it is reported, has awarded the contract for 10,000 ft. of sanitary sewers to C. M. McCandless, of Anderson, at $14,389.

Ardmore, Ind. Ter.—The Council, it is reported, has been petitioned for a franchise to construct a sewer system.

**Des Moines, Ia.*—The King Lambert Constr. Co., it is reported, secured the contract to construct the Cottage Grove Court sewer at $1.59 per lin. ft.

**New Hampton, Ia.*—The following are the bids received Sept. 6 for constructing a sewage disposal plant and sewer system: (*a*) disposal plant; (*b*) 3,810 ft. 15-in. sewer and manholes (M. Tschirge, Engr. in Chg., Dubuque): W. A. Edgar, Cedar Rapids, Ia., *a* $3,450, *b* $5,784; M. Woodruff, Waverly, Ia., *b* $4,922; J. H. Roberts, New Hampton, Ia., *a* $4,124, *b* $4,210 (awarded contract); W. D. Lovell, Minneapolis, Minn., *a* $4,156, *b* $4,719; R. C. De La Hunt, Cedar Rapids, Ia., *a* $3,107 (awarded contract), *b* $5,062.

**Iowa City, Ia.*—Wm. Horrabin is reported to have secured the contract for constructing the Madison St. sewer for $4,459.

Davenport, Ia.—Bids will be received until Sept. 19 by the Bd. Pub. Wks., for constructing about 12,670 lin. ft. 20, 18, 15, 12 and 10-in. sewer pipe in portions of numerous streets. Thos. Murray, City Engr.

Ames, Ia.—Bids will be received by the Mayor and Council until Sept. 25 (readvertisement) for constructing about 3½ miles sewers, requiring about 2,690 ft. 10-in. and 14,980 ft. 8-in. sanitary sewers, 21 lampholes, 21 manholes and 5 combined manholes and flush tanks. A. B. Maxwell, City Clk.

Centerville, Ia.—The following are the bids opened on Sep. 5 for sewers in Area No. 5; Engr., Iowa Engr. Co., of Clinton: Davenport Constr. Co., Davenport, $13,372; Muscatine Constr. Co., Muscatine, $13,195; Cameron, McManus & Joyce, Keokuk, $11,195; R. C. De Lahunt, Cedar Rapids, $10,708; Daily & Brown, Jacksonville, Ill., $10,746, and Jones & Roderick, Canton, S. D., $14,141.

Indianola, Ia.—The Kimball Eng. Co., of Davenport, are engineers for the proposed sewerage system, which will cost about $30,000.

Cresco, Ia.—It is stated that bids will be received until Oct. 2 by the City Clk. for constructing 2 sewers and a sewage disposal plant. W. L. Richards, Chmn. Sewerage Com.

**Hopkinsville, Ky.*—The contract for septic tank, with all fittings and grit chamber in connection with sewerage system, it is stated, has been awarded to Smith & Covington, of Russellville.

Oakland, Md.—See "Water."

**Midland, Md.*—The Town Council intends installing a sewer system and has, it is stated, awarded the contract for about 10 car loads of 24-in. pipe to the Berkeley Stoneware Co., of Berkelely, W. Va.

Baltimore, Md.—The first step toward the building of a sewerage system for Baltimore was taken Sept. 7 by the Sewerage Comn., by the engaging of Rudolph Hering, of N. Y. City; Fredk. P. Stearns, of Boston, Mass., and Saml. M. Gray, of Providence, R. I., as a board of advisory engineers, which is to recommend to the Comn. the method which in their judgment will be best for the disposal of sewage. They are also to furnish to the Comn. a revised estimate of the cost of the establishment of such a system, and to make a report to be submitted by April 1. Probably in January, on the recommendation of the Bd. of advisory engineers, the Comn. will appoint its Ch. Engineer.

Waltham, Mass.—The appropriating of $21,000 for the extension of the sewer system to Roberts Dist. is reported under consideration.

Boston, Mass.—Bids will be received until Sept. 30 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for vitr. pipe scewers and drains and accessories, at the Navy Yard, Boston.

Adrian, Mich.—The question of issuing $100,000 bonds for the construction of a sewerage system is reported under consideration by Council.

Grand Rapids, Mich.—Plans are not yet complete for the sewers for the 11th and 12th Wards, just ordered by Common Council. Bids will probably be called for in about 2 weeks. L. W. Anderson, City Engr.

Benson, Minn.—Bids will be received until Sept. 30 by H. J. Crooks, Village Recorder, for constructing two 12-in. pipe sewers.

Sleepy Eye, Minn.—The Bd. Pub. Wks., it is stated, is about to recommend to the Council the constructing of a sewer in Fairmount Ave., between Milton and Chatsworth Sts., at a cost to the property owners of $1.08 per front foot.

**New Ulm, Minn.*—The following are the bids opened on Sept. 11 by the City Council for constructing 9 blocks of sewers; Jas. Forrestal, St. Paul, $26,700; Ruhlmann & Gronan, New Ulm, $25,760; J. B. Bobbins, Minneapolis, $22,610; Symms Powers Co., Sioux Falls, S. D., $22,600; Cudahy & Cavanaugh, of New Ulm, and O'Neil & Son, Faribault, $20,882; W. D. Lovell, Minneapolis, $19,209 (awarded contract for concrete construction).

St. Paul, Minn.—Bids will be received until Sept. 21 by the Bd. Pub. Wks. (R. L. Gorman, Clk.) for constructing sewers in portion of Maria and University Aves.

Grenada, Miss.—W. R. Wallis, City Engr., writes that it is proposed to extend the sewerage system, at a cost of $5,000.

Cape Girardeau, Mo.—Bids will be received until Oct. 16 by the City Council for furnishing material and constructing a complete sewerage system in Sewer Dist. No. 1, in all about 12 miles of 8 to 22-in. pipe, as advertised in The Engineering Record.

North Platte, Neb.—Bids will be received Oct. 3 for constructing sewer mains, as advertised in The Engineering Record.

Newark, N. J.—As a result of primary elections in Essex County on Sept. 12, it is probable that early action on an extensive joint sewerage system in the Passaic Valley will be undertaken. The successful candidates for county offices on the Republican ticket have adopted a platform strongly advocating it and the Democratic party has long favored it. Powerful corporation influences have been exerted to this end as well, for the diversion of water from the Passaic River for municipal supplies renders it necessary to prevent pollution of the remaining flow by sewage, else serious nuisances will be caused.

Brooklyn, N. Y.—Bids will be received until Sept. 27 by Martin W. Littleton, Boro. Pres., for furnishing materials and constructing sewers in portions of 5 streets. Engineers estimate: 5,135 lin. ft. 18, 15 and 12-in. pipe sewer; 45 manholes; 408 cu. yds. concrete cradle; 25,700 ft. B. M. foundation planking; 62,500 ft. B. M. sheeting and bracing, etc.; also Sept. 20 for furnishing materials and constructing sewers in a portion of Eastern Parkway extension. Engineer's estimate: 497 lin. ft. 12-in. pipe sewer; 35 cu. yds. concrete cradle; 6 manholes; 3,200 ft. B. M. foundation planking, and 16,000 ft. B. M. sheeting and bracing.

Cape May, N. J.—The Council contemplates constructing about 6,000 ft. of 30-in. c.-i. sewers in Beach and Madison Aves. at a cost of about $60,000, and bids for said work will be received about Oct. 15. De Witt D. Barlow, City Engr

Auburn, N. Y.—It is stated that the Common Council has adopted a resolution to reject all bids received recently for constructing the proposed sewers and will receive new bids Sept. 18.

Ballston Spa, N. Y.—Sewer bonds amounting to $90,000, it is reported, have been sold.

Dunkirk, N. Y.—It is stated that bids will probably soon be asked by the City Clk. for constructing a sewer system.

Spencer, N. C.—Pressey & Weller, of Graham, are the engineers in charge of the construction of the proposed sewerage system and the street improvements contemplated at Spencer, work on which will begin about Oct. 1; probable cost of work, $60,000.

**Fargo, N. D.*—The contract to make sewer and water connections with the Capitol, it is stated, has been awarded to Jas. Kennedy, of Fargo, at 53 cts. per ft. for sewer and 93 cts. per ft. for water, the total cost to be about $8,000.

Marion, O.—It is stated that bids will be received by the Bd. Pub. Service, until Sept. 20, for constructing a storm water sewer on Bradford St. Geo. Dwyer, City Engr.

**Willoughby, O.*—C. C. Jenkins, Village Clk., writes that the contract for constructing a storm sewer in Erie St. (bids opened Sept. 11) has been awarded to Phillips & Bixel, of Cleveland, for $3,596.

Cleveland, O.—Asst. City Engr. Hoffman is stated to have completed the work of compiling estimates of work contemplated for Cleveland during this year and reports that about 202 streets, or about 35 miles, of sewers will be constructed at a cost of about $1,200,000; also about 17 miles of pavement at a cost of about $637,492, the material to be used is asphalt, dressed block stone and brick.

Akron, O.—An ordinace has been introduced in Council providing for the construction of a main trunk sewer on Bowery St., Lakeside and Theodore Ave., to cost about $40,000.

Lockland, O.—The Riggs & Sherman Co., of Toledo, have prepared plans for a sewerage and sewage disposal plant for Lockland.

Newark, O.—The Bd. Pub. Service, it is stated, has recommended to the City Council that the City Engr. be authorized to prepare plans for a sewer to be constructed in Webb St.

Dayton, O.—It is stated that an election will probably soon be held to vote on the question of constructing a sewer system, to cost about $125,000.

Dayton, O.—Bids will be received by the Bd. of Public Service until Sept. 26 for the construction of a sewage pumping sation for sewer districts Nos. 6 and 7, as advertised in The Engineering Record. The contract for the pumping house and pumping plant will be let separately.

Middletown, Pa.—The Middletown Drainage Co., it is stated, will soon lay about ½ mile of 12 and 15-in. terra cotta pipe line in East Middletown.

Lansdale, Pa.—The Lansdale Sewerage Co. is reported to be making application for a charter to construct and maintain sewers in Lansdale. J. S. Geller, A. C. Herman and others are reported interested.

Bellevue, Pa.—Bids will be received until Sept. 19 by J. M. Simeral, Clk. Council, 69 Harrison Ave., for constructing sewers in portions of 3 streets; John McBride, Boro. Engr., Fidelity Bldg., Pittsburg.

Sharon Hill, Pa.—The Borough Council is reported to have adopted ordinances providing for the construction of sewers on Calcon Hook Road, Woodland Terrace, Oak and Clifton Aves., and other streets.

McKinney, Tex.—The question of constructing a sewerage system is reported under consideration here.

Newton, N. J.—Bids were opened on Sept. 2 by the Town Committee, for laying about 7 miles of pipe sewers, for furnishing about 7 miles of sewer pipe and building complete 2 sewage purification plants (Engineers, Williams & Whitman, Inc., Whitehall Bldg., New York, N. Y.). Robt. W. Smith bid only for 1 Clinton disposal plant, $26,800, and 1 Diller disposal plant, $12,400. Himman & Sproul bid only for disposal plants, $19,637 and $9,981 respectively. Bids for the furnishing only of the sewer pipe and branches were as follows: M. J. Drummond & Co., $9,633; St. Mary's Sewer Pipe Co., $9,569; G. B. Raymond & Co., $9,569; Arthur N. Pierson & Co., $9,569; Union Sewer Pipe Co., $9,320; F. Bowden, $9,583; Patton Clay Mfg. Co., $9,519; L. F. Niff & Co.; $9,576.

Other bids received were as follows: (1) Totals for construction, (2) totals for pipe and branches: (*a*) Williams & Whitman, Inc., (engineers' estimate), (1) $56,504, (2) $9,565 (*b*) Carhart & Bindernagle, (1) $60,782, (2) $9,589; (*c*) Thos. E. Vermilye, (1) $75,912, (2) $9,934; (*d*) Jos. H. Clements & Son, (1) $83,402; (*e*) A. Costa, (1) $66,183, (2) $9,633; (*f*) Wilkes-Barre Cons. Co., (1) $55,827, (2) $9,519; (*g*) Bell Eng. & Const. Co., (1) $51,382; (*h*) Allen & Wolfe, (1) $43,291, (2) $10,221; (*i*) Unique Constr. Co., (1) $57,340; (*j*) Bowman Bros., (1) $56,396; (*k*) Alfred F. Lutz, (1) $68,955.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*
Laying sewer pipe—											
26,920 ft. 8-in.	$.40	$.70	$.45	$.65	$.40	$.56	$.52	$.59	$.69	$.75	$.70
7,400 ft. 10-in.	.44	.80	.48	.65	.40	.62	.60	.78	.70	.80	.73
3,010 ft. 12-in.	.49	.80	.48	.65	.50	.58	.74	1.00	.75	.90	.71
1,380 ft. 15-in.	.55	1.00	.55	.65	.55	.61	.92	1.50	.75	1.15	.77
Laying Y branches—											
1,450 pieces 8 x 5-in.	.02	.90	.10	.05	.10	.25	.15	.05	.20	.10	.01
380 pieces 10 x 5-in.	.0345	1.00	.10	.05	.15	.25	.18	.05	.20	.20	.01
95 pieces 12 x 5-in.	.04	1.00	.10	.05	.15	.25	.20	.05	.25	.20	.01
4 tons cast-iron pipe	35.00	325.00	25.00	35.00	30.00	40.00	60.00	30.00	50.00	50.00	35.00
Furnishing Sewer pipe—											
26,920 ft. 8-in.	.165	.165	.17	..	.165	.165	..	.18	..	..	..
7,400 ft. 10-in.	.2475	.2475	.255	..	.2475	.2475	..	.26	..	..	..
3,010 ft. 12-in.	.33	.33	.34	..	.33	.33	..	.35	..	..	..
1,380 ft. 15-in.	.513	.513	.53	..	.513	.513	..	.54	..	..	..
Furnishing Y branches—											
1,450 pieces 8 x 5-in.	.7217	.73	.775	..	.7491	.6975	..	.75	..	..	..
380 pieces 10 x 5-in	1.0781	1.10	1.17	..	1.1315	1.054	..	1.12	..	..	..
95 pieces 12 x 5-in.	1.4191	1.45	1.55	..	1.4983	1.395	..	1.47	..	..	..
50 yds. concrete	6.00	7.00	4.00	8.00 †6.10	5.00	6.00	8.00	4.00	5.75	12.00	6.00
11,000 yds. rock excav.	2.90	2.00	4.50	4.60	4.00	2.25	1.30	.75	1.90	1.60	3.00
90 manholes	50.00	40.00	50.00	45.00	30.00	45.00	98.00	45.00	48.00	45.00	45.00
27 flush tanks	100.00	100.00	110.00	85.00	75.00	125.00	166.00	120.00	125.00	100.00	120.00
6 flushing manholes	60.00	50.00	55.00	60.00	105.00	60.00	100.00	50.00	95.00	50.00	60.00
10 M ft. lumber	30.00	20.00	25.00	30.00	25.00	10.00	30.00	30.00	25.00	30.00	40.00
1 Clinton disposal plant	21,560	14,400	17,000	......	18,500	......	30,235	28,600	10,166	42,557.85	......
1 Diller disposal plant	8,870	7,000	13,000	......	11,300	......	16,318	12,400	22,453	18,421	......

† Earth back fill.

**Items marked thus give the names of parties awarded contracts.*

Salt Lake City, Utah.—Bids will be received by the Bd. of Pub. Wks. (E. A. Wall, Chmn.) until Oct. 4 for constructing the extension of the gravity outlet sewer; also same date for constructing the intercepting sewer and pumping station, both advertised in The Engineering Record.

**South Kaukauna, Wis.*—Chris. Johnson, of Oshkosh, is stated to have secured the contract for constructing the 2d Ward sewer for $11,701.

West Alis, Wis.—The Village Bd. has adopted a resolution, and, it is stated, has decided to receive bids for constructing that part of the sewer system provided for by the $15,000 bond issue recently authorized.

**Beloit, Wis.*—Andrew Thompson, of Racine, it is reported, has received the contract to construct a sewer (bids received Aug. 14) at about $14,000.

Fond du Lac, Wis.—The Common Council has adopted the report of the Bd. Pub. Wks., recommending a new system of storm sewers.

**Superior, Wis.*—The Olson-Johnson Co., it is reported. has secured the contract to construct a sewer between Weeks and Grand Aves., at about $6,500.

Fredericton, N. B.—J. W. McCready, City Clk., writes that F. A. Barbour, of Boston, Mass., has been asked to prepare estimates for a sewerage system, and the city will probably commence work of construction next year.

Belleville, Ont.—An election will be held about Jan. 1 to vote on the construction of a sewerage system; C. N. Sulman, Mayor.

Toronto, Ont.—Bids will be received until Sept. 19 by Thos. Urquhart (Mayor), Chmn. Bd. Control, for constructing sewers in portions of 6 streets.

Midland, Ont.—Bids will be received until Sept. 19 by T. I. Trueman, Town Clk., for $12,000 sewer bonds.

BRIDGES.

Notes Arranged Alphabetically by States.

San Diego, Cal.—Plans are stated to have been completed for building an $8,000 bridge across Switzer Creek.

Bluffton, Ind.—It is stated that bids will be received until Sept. 23 by the Co. Comrs. for constructing a concrete arch in Liberty Township. C. S. Brineman, Co. Aud.

**Sioux City, Ia.*—A contract is stated to have been awarded by the Sioux City Traction Co. to the Foundation Co. of New York, N. Y., for the construction of a steel arch under the grade of the Omaha R. R. near the stock yards at a cost of about $30,000. The arch will be located where the Morning Side line passed through the grade, supporting the bridge line of the Omaha Road. It will be 60 ft. in length. Steel and concrete will be the sole materials. It is reported that the Sioux City Stock Yards Co. will assume a share of the cost.

**Bingham, Me.*—The contract for the superstructure of the bridge to be built across the Kennebec River is stated to have been awarded to the American Bridge Co., of New York. The bridge will be 500 ft. long. The cost will be $35,000.

**Pittsfield, Mass.*—The Bd. Pub. Wks. has awarded the contract for constructing the superstructure of the 2d St. bridge (bids received Aug. 30), which is to be a girder bridge, having a 72-ft. span, 28-ft. roadway and two 5-ft. walks, to the Eastern Bridge & Structural Co., of Worcester, at $8,297, and the contract for the substructure to Dwyer Bros., of Dalton, at the following prices (the estimated cost of the substructure was $9,674): Excav., 65 cts. per cu. yd.; concrete for main parts of abutments and retaining walls, $5.15 per cu. yd.

Belle River, Minn.—It is reported that bids will be received until Sept. 23 by the Bd. Co. Comrs. (John N. Brown, Chmn.) for $15,000 bridge bonds.

Minneapolis, Minn.—The City Council is stated to have granted a permit to the Twin City Rapid Transit Co. (W. J. Hield, Mgr.) to construct a viaduct over Division St., at a cost of $100,000.

Neosho, Mo.—The contract for constructing a 2-span steel bridge over Indian River (bids opened Sept. 4) has been awarded to the Midland Bridge Co., of Kansas City, Mo., at $3,249.

Independence, Mo.—It is stated that bids will be received until Sept. 21 by the Co. Comrs. for constructing an 80-ft. steel approach to Indian Creek Bridge on Wormall Road. Oscar Koehler, Road & Bridge Comr.

Jefferson City, Mo.—It is stated that bids will be received until Oct. 1 by Jas. H. Jones, Russellville, for constructing a steel bridge over Coon Creek; F. W. Roer, Co. Clk.

Mandan, N. D.—H. J. Tavis, Co. Aud., writes that the contract for constructing a combination bridge over Heart River (bids opened Sept. 4) has been awarded to Fargo Bridge & Iron Co., of Fargo, N. D., at $4,212.

Columbus, O.—Bids will be received until Oct. 10 by the Bd. Co Comrs., for constructing the west approach to the Park Mills Bridge over Alum Creek, in Mifflin Township; L. E. Jones, Co. Aud.

Cincinnati, O.—It is stated that bids will be received until Sept. 20 by W. M. Duane, Mattoon, Ill., Supt. of Constr. of the Cleveland, Cincinnati, Chicago & St. Louis R. R., for masonry construction in 3 double-track bridges across the Miami River, each to have 5 piers and 2 abutments and located upon the Cincinnati Div.

Dayton, O.—The County Comrs. are stated to have decided to issue $25,000 bridge bonds.

Cleveland. O.—It is stated that the Independence St. viaduct will be constructed at a cost of $74,000. The county paying $28,000, the village of Newburg $10,000 and the city of Cleveland $36,000.

Charleroi, Pa.—The Mercantile Bridge Co. will soon ask for bids for the construction of their proposed bridge between Charleroi and Monessen at North Charleroi. The plans call for a bridge 36 ft. wide, to cost about $500,000.

Greensburg, Pa.—The County Comrs. are stated to have opened on Sept. 4 the following bids for constructing an 80-ft. steel bridge over Four Mile Run, in Ligonier Township: Penn Bridge Co., $5,450; King Bridge Co., $7,488; Climax Road Co., for superstructure, $5,450; American Bridge Co., $5,137, and the York Bridge Co., $7,300.

At a joint meeting of the Comrs. of Westmoreland and Washington Counties, held Sept. 6, it is reported that it was unanimously decided to build a bridge across the Monongahela River between Webster and Donora to cost about $150,000. The structure, including the approaches, will be 1,700 ft. in length.

Coudersport, Pa.—The County Comrs. are stated to have awarded the contract for constructing the Galeton Bridge to the York Bridge Co., of York, at $5,800.

Seattle, Wash.—The following bids are stated to have been received Aug. 30 for constructing a bridge over Wishkah River on Heron St.: Puget Sound Bridge & Dredging Co., Seattle, $25,500; International Contract Co., Seattle, $27,175; Pacific Bridge Co., Portland, Ore., $27,625; Northwestern Bridge Co., Tacoma, $28,200, and Portland Bridge Co., Portland, Ore., $29,480.

Portage, Wis.—It is stated that bids will be received until Sept. 20 by the City Council for constructing the substructure of a highway bridge across the Wisconsin River, consisting of 3 concrete piers and 2 concrete abutments. L. P. Wolff, Consulting Engr., St. Paul, Minn.; M. J. Downey, Chmn. Bridge Com.

Pinkerton, Ont.—Bids will be received until Sept. 23 by J. J. Donnelly, Clk. Township of Greenock, for $5,000 bonds for constructing steel bridges.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

Birmingham, Ala.—The City Council is stated to have adopted a resolution providing for the paving with bituminous macadam on Highland Ave.

Denver, Colo.—The Bd. of Pub. Wks. is stated to have adopted plans and specifications for paving with sandstone block pavement in Dist. No. 6, at a cost of $18,792. According to reports bids will soon be received.

New Britain, Conn.—About $9,000 or $10,000 worth of State macadam roads are to be built by the town.

Columbus, Ga.—Bids will be received until Oct. 3 by the Supt. Pub. Wks. for paving Broad St., in all about 15,000 sq. yds., as advertised in The Engineering Record.

Belleville, Ill.—L. L. Harper, City Engr., is preparing plans and specifications for about 150,000 sq. yds. brick paving.

Champaign, Ill.—C. D. Stevens, City Clk., writes that bids will be opened at 2 P. M., Sept. 22, for paving Randolph St. with brick on a Portland cement foundation, combination curb and gutter, drains, bridges and cement grout fill, with expansion joints; probable cost, $52,015.

Waukegan, Ill.—M. R. Miller, Supt. Bd. Pub. Wks., writes that the following are the bids opened on Sept. 8 for granite top macadam: (*a*) Utica St., (*b*) Hickory St.; Jas. Cape & Sons, Racine, Wis., *a* $6,849, *b* $17,522; M. Foley, Evanston, *a* $6,976, *b* $17,692; Smith & Brown, Chicago, *a* $7,045, *b* $19,329; John W. Barker, Melrose Park, Ill., *a* $7,647, *b* $19,745.

Sterling, Ill.—It is stated that bids will be received until Sept. 19 for 17,627 sq. yds. brick paving, estimated to cost $29,896. John D. Arey, City Engr.

Sterling, Ill.—Chas. J. Bessler, of Cedar Rapids, Ia., is stated to have received the contract for macadamizing about 22 blocks of streets here, for $15,302.

Ft. Sheridan, Ill.—Bids will be received until Sept. 20 by Capt. Wm. Weigel, Q. M., U. S. A., for constructing concrete walks, roads and grading about newly constructed buildings at this post.

Indianapolis, Ind.—Bids will be received until Sept. 25 by the Bd. Pub. Wks. (M. A. Downing, Pres.) for grading, graveling and rolling the roadway on a portion of Ella St., and grading and paving the sidewalks with cement on a portion of Elder Ave.

Bids will be received until Sept. 22 by the Bd. Park Comrs. (Hiram Brown, Chmn.) for furnishing materials and constructing a portion of Pleasant Run Boule.

Iowa City, Ia.—Bids will be received until Sept. 22 at the office of F. H. Dondore, City Clk., for furnishing materials, grading and curbing with stone and paving with one course of brick, portions of Court, College and Capitol Sts. Approximate quantities: 12,886 sq. yds. pavt.; 5,078 cu. yds. grading, 3,224 lin. ft. new curb.; 780 lin. ft. old curb., to be redressed and reset, etc.

Hutchinson, Kan.—Paving bonds amounting to $145,000 are reported sold.

Rockville, Md.—Bids will be received until Sept. 19 by the Bd. Co. Comrs. (Robt. G. Hilton, Clk.) for grading and macadamizing about 1 mile of the public highway.

Sykesville, Md.—Bids will be received until Oct. 2 by the Road Comrs. of Freedom Dist. (Jas. C. Hewitt, Chmn.) for grading and macadamizing about 1 mile of the public highway.

**Boston, Mass.*—Contracts for constructing State roads are stated to have been awarded by the Massachusetts Highway Comn., as follows: To Daniel E. Lynch, Dorchester, for building road in Gloucester, for $5,792; to R. F. Hudson, Melrose, for road in Burlington, for $6,173; to Jos. J. Moebs, Quincy, for the Canton road, $3,753; to the Lane Constr. Corp., of Meriden, Conn., for a road in North Brookfield, for $4,311, and to O. T. Benedict, Pittsfield, for a road in Chicopee, for $2,244.

Fall River, Mass.—Main St. is to be widened at a cost of $2,500, the Street Dept. doing the work itself. Frank A. Thurston, Supt. of Streets.

**Lansing, Mich.*—Following are the bids received Aug. 28 for paving Ottawa St., in all about 15,233 sq. yds., the city to furnish the brick (H. A. Collar, City Engr.): Green & Redman, $17,576; J. H. Algate, $16,000; M. E. Fitzpatrick, $15,488; W. H. McKale, $15,160; Geo. H. Kneal, $15,000, and Frank Farrell, $13,154 (awarded contract).

**Detroit, Mich.*—The contract for paving Grand Boule. is stated to have been awarded to Lennane Bros., 40 W. Fort St., and Thos. J. Kennedy, 232 Hubbard Ave., for $81,458 and $51,342 respectively.

Niles, Mich.—It is stated that bids will be received until Sept. 25 by Carl F. Whetstone, City Clk., for paving 4th St.

**Butterfield, Minn.*—The contract for paving with brick portions of Main and Chestnut Sts. is stated to have been awarded to Carlson & Sandquist, of Stillwater, at $2 per sq. yd.

Macon, Mo.—C. J. Du Bois, City Engr., writes that the city will let contract about Oct. 2 for 2,500 sq. yds. paving; also later on for 10,000 sq. yds. He further states that the following bids were recently opened for paving: *a* 8,000 sq. yds. single-course brick paving; *b* 4,000 lin. ft. curb, and 1,800 cu. yds. grading: Geo. Kohl & Co., Macon, *a* $1.10, *b* 20 cts., *c* 28 cts.; Cameron & MacManus. Keokuk, Ia., *a* $1.18, *b* 23 cts., *c* 28 cts.

Rye, N. H.—Bids will be received by A. W. Dean, State Engr., Rumford Press Bldg., Concord, until Sept. 26, for constructing a section of State road in the town of Rye, as advertised in The Engineering Record.

Concord, N. H.—Bids will be received until Sept. 25 by A. W. Dean, State Engr., for road improvements in the towns of Coldbrook, Merrimack and Sherburne.

Bayonne, N. J.—The following are the bids received Sept. 5 for paving with brick on Dodge St.: (*a*) 140 lin. ft. new curb; (*b*) 810 lin. ft. curb reset; (*c*) 60 sq. ft. bridge stone relaid; (*d*) 50 sq. ft. flag relaid, and (*e*) 1,547 sq. yds. brick paving (F. J. Dalrymple, City Engr.): Jas. J. Cogan, Bayonne, N. J., *a* 65 cts., *b* 12 cts., *c* 12 cts., *d* 3 cts., and *e* $2.23; Martin Murray, Bayonne, N. J., *a* 55 cts., *b* 8 cts., *c* 10 cts., *d* 3 cts., and *e* $2.74; Wm. Van Keuran, Jersey City, *a* 67 cts., *b* 10 cts., *c* 7 cts., *d* 3 cts., and *e* $2.26.

Paterson, N. J.—Bids will be received until Oct. 3 by the Road Com., Bd. Chosen Freeholders (David Wickham, Chmn.) for repairing and paving portions of 4 streets.

Newark, N. J.—It is stated that street improvement bonds amounting to $231,000 have been sold.

Jersey City, N. J.—The Bd. of Finance is stated to have decided to pave the following streets: Bergen Ave. and Bergen Sq., with asphalt, at $23,908; Montgomery St., at a cost of $4,375, and repaving Hudson St., at $4,775.

New York, N. Y.—Bids will be received until Sept. 22 by Maurice Featherson, Comr. Docks, for furnishing materials and paving with asphalt the decks of piers 57 and 58 North River, together with their lateral extensions or bulkhead platforms and work incidental thereto; also same date for furnishing, delivering and putting in place about 15,000 cu. yds. small cobblestone.

**Brooklyn N. Y.*—The following are the bids opened on Sept. 13 by Martin W. Littleton, Pres. Brooklyn Boro., for regulating and repaving with asphalt on a concrete foundation (*a*) Kosciusko St., 8,130 sq. yds., (*b*) Vernon Ave., 5,915 sq. yds. Barber Asphalt Paving Co., 114 Liberty St., New York; *a* $15,184, *b* $10,928; Cranford Co., 52 9th St., Brooklyn, *a* $14,211 (awarded contract), b $10.195 (awarded contract); Uvalde Asphalt Paving Co., 1 Bway., New York, *a* $14,655, *b* $10,816.

**Brooklyn, N. Y.*—The following are the bids opened Sept. 13 by Martin W. Littleton, Pres. Brooklyn Boro., for regulating and repaving with asphalt on a concrete foundation Atlantic Ave. from 6th to Nostrand Ave.: (*a*) Cranford Co., 52 9th St., Brooklyn; (*b*) Barber Asphalt Paving Co., 114 Liberty St., New York; (*c*) Brooklyn Alcatraz Co., 12th St. and Gowanus Canal, Brooklyn (awarded contract); (*d*) Uvalde Asphalt Paving Co., 1 B'way, New York.

	a	*b*	**c*	*d*
32,780 sq. yds. asphalt...	$1.02	$1.48	$.72	$.84
170 sq. yds. old pavt. relaid	.30	.30	.20	.35
5,460 cu. yds. concrete....	4.00	4.23	4.25	4.00
6,330 lin. ft. new curb..	.80	.82	.80	.78
6,320 lin. ft. old curb relaid	.30	.30	.30	.35
107 manhole covers.......	15.00	14.00	12.00	14.00
1,000 cu. yds. earth excav......		.75	1.12	20.50
99,820 sq. ft. cmt. sidewalks	.15	.15	.14	.14
Totals	$79,615	$96,339	$69,259	$72,557

**Albany, N. Y.*—The Bd. Contract and Supply is stated to have awarded contracts for paving as follows: E. F. Dillon, 5 N. 1st St., with brick on Lake Ave. and Thornton St., $15,021; M. F. Dollard, 86 State St., with brick on Clinton Ave., $40,609; Mulderry Bros., 115 1st St., with brick on Colby, Bassett and Quail Sts., $39,944, and North Hudson Constr. Co., for resurfacing Delaware Ave. with asphalt, $20,440.

Johnstown, N. Y.—Bids will be received by Frank Bogaskie, City Clk., until Oct. 2 for paving with asphalt block N. and S. Market and S. Perry Sts., about 11,800 sq. yds., as advertised in The Engineering Record.

Buffalo, N. Y.—Bids will be received until Sept. 21 by the Dept. Pub. Wks. (Francis G. Ward, Comr.) for paving a portion of Ludington St.

**Herkimer, N. Y.*—The contract to pave about 940 sq. yds. on Main St. with Metropolitan block (bids received Aug. 28) has been awarded to F. N. Lewis, of Herkimer, at $2.50 per sq. yd. for paving and $1 per lin. ft. for Medina stone curbing. F. C. Murray, Village Clk.

**Rochester, N. Y.*—The Rock Asphalt Paving Co., 279 South Ave., is stated to have received the contract for paving with asphalt on Franklin St., for $15,750.

Spencer, N. C.—See "Sewerage and Sewage Disposal."

Cleveland, O.—It is stated that bids will be received until Sept. 30 by the Co. Comrs. (Julius C. Dorn, Co. Clk.) for repaving Wooster Pike.

Napoleon, O.—It is stated that bids will be received until Sept. 18 by F. J. Beck, Co. Aud., for $22,000 road improvement bonds.

Royalton, O.—The Citizens are stated to have voted to issue $13,125 bonds for improving public highways.

**Findlay, O.*—C. B. Hall & Son are stated to have received the contract for paving portions of Washington St. and Tiffin Ave., at $13,200 and $23,374 respectively.

**Paulding, O.*—The contract for paving a portion of S. William St. is reported to have been awarded to W. J. Johnson for $6,106.

Marion, O.—The Bd. of Pub. Service is stated to have opened bids Aug. 23 for paving with asphalt on a portion of Church St.: J. W. Scott, for excavation, curbing, tiling and catch basins only, $3,853; Barber Asphalt Paving Co., of Philadelphia, Pa., $18,104; Standard Paving Co., of Cleveland, $20,184, and Mayer Bros., of Erie, Pa., $16,359.

**Items marked thus give the names of parties awarded contracts.*

Cleveland, O.—See "Sewerage and Sewage Disposal."

Cincinnati, O.—Warren Bros. Co., of Boston, Mass., are stated to have submitted the lowest bid for paving with bitulithic on a portion of Fairfax Ave., at $2.50 per sq. yd., or a total of $47,996.

Greenville, O.—Bids will be received until Sept. 29 by the Bd. Co. Comrs. for $6,000 road improvement bonds; E. Culbertson, Co. Aud.

**Dayton, O.*—Couch & Kunkle, Dayton, have secured the contract for about 2,700 sq. yds. brick paving (bids opened Sept. 5) at $4,707.

Steelton, Pa.—John D. Young, Secy. Boro. Council, writes that the date of opening of bids for paving Front St. 31,500 sq. yds. with asphalt Creo-resinate wooden block, vitrified brick or any other improved material on a 6-in. concrete base, has been extended from Oct. 4 to Nov. 1, as advertised in The Engineering Record.

Yeadon, Pa.—Bids will be received until Sept. 20 by L. K. Watkin, Secy., Highway Com. of Council, for constructing about 3,600 sq. ft. cement sidewalks.

Greensburg, Pa.—The following are reported to be the bids received for improving portions of *a* Pennsylvania Ave.; *b* 4th St., and *c* E. Pittsburg St.: Greensburg Constr. Co., *a* and *b*, with concrete curb, $4,531, with stone curb, $4,736, *c* with concrete curb, $10,380, with stone curb, $10,630; W. W. Kelly, of McKeesport, *a* and *b* $5,308, and *c* $11,110; Greensburg Stone Co., *a* and *b* $4,674; Bowman Bros., of McKeesport, *a* and *b*, with stone curb, $4,594, with concrete curb, $5,147.

Oakmont, Pa.—Bids will be received until Sept. 20 by the Boro. Council (Geo. D. Stoup, Clk.) for grading, curbing and paving portions of West "B," East "B," "E" and "H" Sts. Approximate quantities, 35,000 cu. yds. grading; 26,000 lin. ft. curbing and 45,000 sq. yds. paving; M. Douglas, Boro. Engr., 515 Times Bldg., Pittsburg.

Bellevue, Pa.—Bids will be received by J. M. Simeral, Clk. Council, 69 Harrison Ave., until Sept. 19 for grading, curbing and paving a portion of Kendall St., and grading and curbing a portion of Jefferson St.; John McBride, Boro. Engr., Fidelity Bldg., Pittsburg.

**Uniontown, Pa.*—The following are the bids received Sept. 4 for furnishing 670,000 brick f. o. b. Uniontown, price given per M (Chas. F. Kefover, Boro. Solicitor): Fayette Fire Brick Co., Uniontown, Pa., $10.45; Loyton Fire Clay Co., McKeesport, Pa., $10.10 (awarded contract), and Mack Mfg. Co., Pittsburg, Pa., $11.50.

*Bids received same time for doing work and furnishing all material except brick for the paving of Mt. Vernon Ave., were as follows: (*a*) excav. per cu. yd.; (*b*) curbing, per lin. ft.; (*c*) paving, per sq. yd. (bidders of Uniontown): Uniontown Constr. Co., *a* 40 cts., *b* 60 cts., *c* 58½ cts., and W. C. McCormick, *a* 33⅓ cts., *b* 57 cts., *c* 52½ cts. (awarded contract).

Providence, R. I.—Contracts have been awarded as follows for constructing State roads (bids received Sept. 6): Town of Cranston, in Cranston, 3,300 ft., $2,318; town of Lincoln, in Lincoln, 5,280 ft., $3,765; town of Cumberland, in Cumberland, 10,560 ft., $4,107; 2,640 ft. in N. Providence, Wm. A. Sweet, North Providence, R. I., $2,243; 5,280 ft. in Warwick, Chas. A. Johnson, Pontiac, R. I., $2,964; 2,500 ft. in Middletown, J. Overton, Peckham, Middletown, R. I., $1,362; 2,640 ft. in New Shoreham, John C. Champlin, Block Island, $2,690, and 5,280 ft. in Richmond, $2,738, and 4,931 ft. in Warren, $2,322, John Bristow, Narragansett Pier.

Houston, Tex.—Bids will be received by John B. Ashe, Co. Aud., until Sept. 25, for constructing a portion of the Westheimer Road. Approximate quantities: 19,000 cu. yds. grading; 16,000 cu. yds. drainage ditching; 15,000 ft. B. M. bridging; also for grading about 1½ miles of Red Bluff Road; approximate quantities: 6,000 cu. yds. grading, 1,000 cu. yds. ditching.

Roanoke, Va.—It is stated that bids will be received until Sept. 28 by W. E. Thomas, Clk. of Council, for constructing brick sidewalks on various streets. J. H. Wingate, City Engr.

Stevenson, Wash.—C. O. Williams, of Douglas, County Surveyor, writes that the Comrs. of Skamania County have decided to construct the Lyle-Washougal State Road, at a cost of $15,000. Bids will probably be called for in the beginning of the year 1906.

**Janesville, Wis.*—Elzy & Dunn, of Marshalltown, Ia., have secured the contract for paving a portion of Milwaukee Ave. with macadam (bids opened Sept. 11) for $3,894.

Toronto, Ont.—Bids will be received until Sept. 19 by Thos. Urquhart (Mayor), Chmn. Bd. Control, for paving portions of several streets with bitulithic, macadam and tar macadam; also constructing concrete walks on portions of 14 streets.

POWER PLANTS. GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Roosevelt, Ariz.—Bids will be received until Nov. 1 by O. H. Ensign, Electrical Engr., U. S. Reclamation Service, Los Angeles, for furnishing complete f. o. b. bidders' works, 1 or more alternating-current, 900-kw, 25-cycle generators, 1 or more 100-kw, direct-current generators for exciter, and a switchboard containing 1 panel for generator and 1 panel for exciter, for use in Roosevelt power house, Salt River Project, Ariz.

Little Rock, Ark.—John B. Jones and associates are reported to have secured franchise for the construction of a gas plant.

Stockton, Cal.—The Middle River Navigation & Canal Co. (O. P. Phillips, Consulting Engr., 1334 Spruce St., Berkeley) expect to place a number of electrically-driven pumps and erect or purchase ditching (trench) machinery. The cost has not been estimated as yet.

Rialto, Cal.—A. L. Selig, Mgr. of the Edison Electric Co., it is reported, has made a proposition to the citizens of Rialto to extend wire for 10,000 volts from San Bernardino, the Rialto citizens to establish their own local operating company, furnish wires, meters, transformers, etc.

Washington, D. C.—Bids will be received until Sept. 26 at the Bureau Supplies and Accounts, Navy Dept., Washington, for delivering and installing 3 water-tube boilers and machinery for the power house at the Naval Hospital here; also same date to furnish at the Navy Yards, etc., Boston, Mass., Newport, R. I., New York, N. Y., Washington, D. C., and Norfolk, Va., a quantity of naval supplies as follows: Incandescent lamps, electrical supplies, voltmeters, ventilating fans, broken stone, cast-iron pipes, steel, galvanized pipe and fittings, etc. H. T. B. Harris, Paymaster-Gen., U. S. N.

Washington, Ga.—Capt. J. H. Fitzpatrick, of Washington, is reported to have purchased the Anthony Shoals property in this county, and will develop this power on the line between Wilkes and Elbert Counties and transmit same to Washington, Elberton and Anderson, S. C., and build a railroad from Washington to Elberton.

Jackson, Ga.—The citizens are reported to have voted Sept. 5 to issue $40,000 bonds for water works and an electric light plant.

Weiser, Idaho.—The Swan Falls Light & Power Co. is reported to have petitioned for a franchise to light the city.

**Eureka, Ill.*—W. J. Whetzel, it is stated, has secured the contract to light the city until June 1, 1906. The bid submitted was $2.50 per light per month until midnight and $3 per light per month until 1 a. m.

Chicago, Ill.—Bids will be received until Sept. 21 by Wm. Carroll, City Electrician, for furnishing about 29,000 ft. of 00, B. & S. G., hard drawn, triple braid weatherproof copper line wire; 14,000 ft. 00, B. & S. G., 3 conductor rubber and lead encased electric light cable; 3 75-kw. constant potential step-down transformers.

Cuba, Ill.—A new 150-hp. engine simple automatic and a 100-kw., single-phase, 125-cycle alternator is to be installed in the municipal plant. L. Monch, Supt.

Jasonville, Ind.—It is reported that the Jasonville Electric Co. (Jas. H. Parsons, Pres.) will soon ask bids for constructing an electric light plant here.

Roff, Ind. Ter.—F. W. Dunn writes that he proposes constructing water, ice and cold storage plant and gas works, at a cost of $60,000.

Marshalltown, Ia.—It is stated that the Council has authorized the Water & Light Com. to make repairs to the lighting plant; 2 new dynamos are needed.

Ottawa, Kan.—Mayor Halloren, it is reported, has signed the ordinance granting a gas franchise to C. H. Patterson.

Ft. Leavenworth, Kan.—Bids will be received until Oct. 4 by Capt. J. E. Normoyle, Constr. Q. M., U. S. A., for extending the electric lighting system at Ft. Leavenworth.

Ashland, Ky.—The Virginia Light & Power Co. is reported incorporated, with a capital of $25,000, to construct an electric lighting system from Richmond, Va., to Ashland.

Hyattsville, Md.—A committee has been appointed to report on the construction of a municipal electric light plant. Harry W. Shepherd, Chmn. Light Com.

Lowell, Mass.—It is reported that bids will probably soon be asked for lighting the streets with gas.

Olathe, Mo.—The Olathe Gas Co. is reported incorporated with a capital of $200,000. Incorporators: A. F. Smith, L. F. Davidson and M. C. Beckwith.

Big Timber, Mont.—The Big Timber Electric Light & Power Co., it is reported, has petitioned for a franchise for water works and an electric light system.

**Helena, Mont.*—The S. Morgan Smith Co., of York, Pa., it is stated, has secured the contract for 4 pair of main water wheels to be constructed of c. i., and each pair to have a capacity of 4,000 h.-p. for the Helena Power Transmission Co. The Allis-Chalmers Co., of Milwaukee, Wis., it is stated, secured the contract for furnishing the auxiliary or exciter wheels.

It is stated that the contract for the electrical machinery is yet to be let.

Virginia City, Mont.—The Butte Electric Light & Power Co., of Butte, is reported to have petitioned for a franchise to furnish this city with electric light and power.

Newark, N. J.—Morris R. Sherred, Ch. Engr., it is reported, is preparing estimates for a municipal lighting plant.

**New York, N. Y.*—The Otis Elevator Co., of New York, has secured the contract for the electric plant for the U. S. Custom House, omitting elevators 2 and 5, for $79,910.

Syracuse, N. Y.—Local press reports state that bids will be received until Oct. 3 by the Bldg. Com. for furnishing and installing electric light fixtures in the Court House, requiring about 1,300 fixtures. Probable cost, $20,000. The electric wiring is to be let under a separate contract. J. E. Woodwell, Washington, D. C., Engr. in charge.

Press reports state that bids will be received until Sept. 25 by the Bd. Contract and Supply for lighting the city for 1, 2, 3, 4 or 5 years; also price for incandescent lighting for all city buildings and the maximum price for incandescent lights for private consumers.

Utica, N. Y.—Bids will be received until Sept. 27 by the State Comn. in Lunacy at the Capitol, Albany, for engine, generators, switchboard and motors, feed cables and wiring, steam piping and connections at the Utica State Hospital, as advertised in The Engineering Record.

New Brighton, S. I., N. Y.—Bids will be received until Sept. 25 by C. B. J. Snyder, Supt. School Bldgs., New York City, for installing electric equipment in addition to School No. 23, Boro. Richmond.

South Brooklyn, O.—The East Ohio Gas Co., it is reported, has petitioned the Village Council for permission for a perpetual right of way for a pipe line through the village, the terminals to be in Virginia and Toledo, O. The petition, it is stated, also includes a telephone and telegraph line. The company does not propose furnishing gas to the village.

Columbus, O.—It is reported that the Ohio Fuel & Supply Co. has increased its capital from $4,000,000 to $8,000,000 and intends constructing a loop to connect the gas main running to Worthington with one to Arlington, and also to build an 18-in. line diagonally across the state from Homer, Knox County, to Norwood, just outside of Cincinnati. It is stated that the improvements to be made by the company are estimated to cost $2,500,000.

**Plymouth, O.*—Contracts for water and light plant (bids opened Aug. 28) have been awarded as follows: Engine and pumps to Strong, Carlisle & Hammond Co. for $4,015, and electrical equipment to the Ft. Wayne Electric Co., of Ft. Wayne, Ind., for $1,119.

East Cleveland, O.—The Council is reported to have granted a 40-yr. franchise to the East Ohio Gas Co.

Huntingdon, Pa.—The Juniata Water & Water Power Co. is reported incorporated, with offices at Huntingdon and Philadelphia. The company has purchased property for the erection of a hydro-electric power plant in Warrior Ridge Gap, and construction will, it is said, be started as soon as plans can be prepared; the cost of the proposed plant will be about $1,000,000 and power will be transmitted to Huntingdon, Tyrone, Altoona and other towns in this vicinity. S. L. Brumbaugh, Pres., Philadelphia.

Greencastle, Pa.—The Greencastle Light, Heat & Power Co. (Harry C. Hollinger, Philadelphia, Treas.) has been incorporated, according to reports, with a capital of $10,000, to furnish light, heat and power to Greencastle.

Bamberg, S. C.—Press reports state that this city will receive applications for a franchise for the construction of water works and an electric light plant.

Pierre, S. D.—The City Council is reported to have decided to install an incandescent electric light plant.

Groton, S. D.—The Groton Light, Heat & Power Co. (C. D. Jones, Secy.) proposes constructing a central heating plant. H. E. Miles, Engr., Groton.

Chattanooga, Tenn.—Local press reports state that the plans for the lock and dam and the power plant of the Chattanooga-Tennessee River Power Co., to be constructed at Hales bar in the Tennessee River, at a cost of about $3,000,000 are now ready for inspection of contractors at the office of the U. S. Engineer, in the Loveman Bldg. Bids will probably be called for at once. John Bogart, Consulting Engr., 16 Exchange Pl., New York, N. Y.

Knoxville, Tenn.—Later reports state that bids will be received until Sept. 25 by the Bd. Pub. Wks. (Wm. Epps, Chmn.) for lighting the streets of this city by electricity or gas, per lamp each, for not less than 300 lamps, for a term 3, 5, 7 and 10 years.

**Readsboro, Vt.*—Walter S. Morton, 36 Pearl St., Hartford, Conn., Chief Hydraulic Engr. for the proposed electric power plant on Deerfield River, writes that the work is not yet ready for construction.

**Burlington, Vt.*—The Plummer Electric Co., of Boston, Mass., has secured the contract for the conduit and wiring system for the U. S. Post-Office (bids opened Aug. 22) for $1,813.

Cashmere, Wash.—It is reported that F. C. Barnum, of Cashmere, is endeavoring to obtain a franchise to erect an electric light plant here.

Toronto, Ont.—The City Council is stated to have decided to send to the Finance Com. the report from the Fire Com. that an expert be appointed to estimate the cost of a city gas plant and what gas could be sold at from such a plant.

**Guelph, Ont.*—John Yule, Mgr. & Treas. Gas Works, writes that the Empire Gas Improvement Co., 49 Wall St., New York, N. Y., has secured the contract for extending the gas plant (bids opened Sept. 1) for $58,382.

ELECTRIC RAILWAYS.

Notes Arranged Alphabctically by States.

Albertville, Ala.—The North Alabama Railway, Light & Power Co. is reported to have filed with the Secretary of State a notice of its recent incorporation. Capital, $100,000. It is understood that its object is to build an electric railway through Albertville, Boaz, Whiteville, Attalla and Alabama City. Incorporators: J. G. Elrod, W. M. Coleman, Geo. M. Rains, T. B. McNaron and others. The company's offices will be in Albertville. The notice filed with the Secretary of State states as the object of its organization to build a railway to be operated by steam or electricity from a point near Elrod's mills in De Kalb County, to run on through the rest of the county and the counties of Etowah, Marshall and others that may be later determined upon.

Santa Rosa, Cal.—The Petaluma & Santa Rosa Electric Ry. Co. is stated to have decided to extend its line from Forestville to Trenton.

Los Angeles, Cal.—Several citizens of Pomona are stated to have started a movement for an independent electric power plant and street railway covering a radius of about 35 miles, taking in Ontario, Chino, Claremont, Lordsburg, San Dimas and Covina. F. A. Molyneaux, of Pomona, is reported interested in the scheme.

Seth. Hartley, of Colton, is stated to have pertitioned the City Council of San Bernardino and the City Trustees of Colton for franchises to operate an electric railway traversing sections of both cities, and connecting with the Southern Pacific and Salt Lake freight yards at San Bernardino, a branch line projecting out First St., passing through Rialto, Etiwanda, Iamosa, Hermosa, North Cucamonga, and terminating at Uplands.

Dover, Del.—Application is stated to have been made to the Kent County Levy Court by the interests that propose to build an electric railway the entire length of Kent County, with spurs to the different summer resorts and inland towns, for the rights of way over the county roads. Attorney Chas. H. LeFevre and Attorney E. H. Gilch, of Chicago, are reported interested in the project. The intention of the promoters is first to run the line from Clayton to Smyrna, and to Woodland Beach. When this shall have been completed the line will be extended to Dover, and to Milford. Undoubtedly it will be extended through Sussex County to the end of the Delaware line at Rehoboth, as has been anticipated.

Washington, Ga.—See "Power Plants, Gas and Electricity."

Dixon, Ill.—The Freeport-Dixon Electric Ry. Co. is stated to have received a franchise to construct an electric railway in Dixon. Owen T. Smith, Pres.

Chicago, Ill.—Bion J. Arnold is stated to have presented to the Local Transportation Com. his report on the proposed traction system of 264 miles, which he estimates could be constructed for $25,000,000. He recommends that provisions be made in plans for extensions of the system which would cost about $2,000,000; he further recommends a heavier rail, which would add $1,000 per mile to the cost of Mr. Du Pont's system.

**Items marked thus give the names of parties awarded contracts.*

Anderson, Ind.—The Indiana Union Traction Co. is stated to have announced that the company will soon begin the construction of a new and more direct line from Jonesboro into Marion.

Bradford, Ind.—The City Council is stated to have granted a franchise to the Indianapolis & Ohio Valley Traction Co., which is to build from Indianapolis to Rockport and Evansville.

Marion, Ind.—John Ratliff, of this city, it is stated, has asked the Commissioners of Grant County for a franchise for an electric line to run from Marion to Noblesville, which is to connect there with another line proposed to run to Indianapolis.

Brazil, Ind.—It is stated that the Indianapolis & Ohio Valley Traction Co. expects to connect Brazil and Bloomington.

**Davis, Ind. Ter.*—E. P. Spears, of Dallas, Tex., is stated to have closed a contract with the Lovejoy Construction Co., of Ft. Worth, to grade 10 miles for an electric railway from Sulphur to Davis. The line from Oklahoma City to Sulphur will be 84 miles long, and will cost $3,000,000.

Council Bluffs, Ia.—The survey for the electric railway from this city to Griswold is reported to have been completed. The line will be 40 miles long.

Marshalltown, Ia.—H. L. Smith and C. P. Knowlton, of Indianapolis, Ind., is reported interested in the proposed construction of an electric railway from Marshalltown to Grundy Center, and to Waterloo, and ultimately to construct another line to Newton.

Mt. Sterling, Ky.—It is stated that the Blue Grass Traction Co. will shortly begin the building of a 25-mile electric railway from Paris to Mt. Sterling.

Lowell, Mass.—It is stated that plans are being perfected for a new electric railway between Boston and Lowell. Among those prominent in the affairs of the proposed line are Gen. Adelbert Ames, Congressman Butler Ames and Paul Butler, of Lowell, and Lucius Tuttle, of the Boston & Maine R. R. From Boston the line will run through Reading, Andover and Tewksbury and Lowell.

Palmer, Mass.—The Springfield & Eastern St. Ry. Co. is stated to have petitioned the Selectmen of the towns of Monson and Brimfield for franchises allowing it to build a line to Fiskdale. The proposed line will run from the Monson line, about a mile from Palmer, on the south side of the Quaboag River, to Fentonville direct to Brimfield, and Fiskdale. The company proposes to begin construction as soon as it has secured its rights and the legal requirements have been complied with.

Monroe, Mich.—It is stated that the Detroit, Monroe & Toledo Short Line Electric Ry. will probably build a branch to Dundee from this city, a distance of 15 miles. Charles R. Hannan, of Boston; President Slush and Gen. Mgr. Tarkington are stated to be interested in the project.

Kalamazoo, Mich.—The West Michigan Ry. Co. is reported to have filed articles of incorporation and will succeed the West Michigan Traction Co. in the project for the building of 85 miles of trolley line from Benton Harbor to Kalamazoo, with branch lines. B. L. Brown is reported interested.

Westfield, N. Y.—The Westfield St. Ry. Co. is reported incorporated, with a capital of $10,000. Directors: Geo. J. Spontag, Richard S. Storrs, Jos. J. Smith, New York City; Frank L. Chase, Jamestown, and others.

Syracuse, N. Y.—The Syracuse, Lake Shore & Northern R. R. Co. is reported to have been incorporated with a capital of $2,500,000, to take over and operate the old Syracuse, Lakeside & Baldwinsville R. R., between Syracuse and Baldwinsville. It is to be extended to Fulton and Oswego. H. S. Holden, C. M. Warner, A. K. Hiscock and others are directors.

The Auburn & Syracuse Constr. Co. is reported incorporated with $25,000 capital, to carry on improvements planned for the Auburn & Syracuse Electric Railroad, including double tracking.

Hendersonville, N. C.—It is stated that the Appalachian Interurban Electric Co. will construct an electric railway between Hendersonville, Asheville and Gaffney, S. C., via Chimney Rock and Rutherfordton. W. A. Smith, pres.

Toledo, O.—It is stated that the Toledo, Port Clinton & Lakeside Ry. Co. is securing right of way for a line between Genoa and Toledo. At present it covers this route over the tracks of the Lake Shore Electic Railway, but it desires to have its own route, and will thereby open up territory north of the Lake Shore at present undeveloped. The company is also planning to extend its service into Sandusky, either by bridging Sandusky Bay or operating a ferry from Lakeside. This will make a short route between Sandusky and Toledo.

Cleveland, O.—Jas. W. Holcomb is reported to have secured practically all the private right of way required for constructing an electric railway from Bedford to Alliance. The company will be incorporated as the Cleveland, Ravenna & Alliance. The line will parallel the Pennsylvania Railway, touching Bradley's Lake, Ravenna, Atwater and several smaller towns, a total of 57 miles. A power station will be erected at Ravenna.

C. H. Hubbell, promoter of a line from South Brooklyn to Berea is stated to have obtained a franchise from the County Comrs. to build over the Wooster Pike.

L. J. Lederer, of Cleveland; W. B. Thompson, of Lorain, and C. Stuber, of Avon, are stated to have secured right of way for an electric railway from Cleveland to South Lorain, independent of either the Lake Shore Electric or the Cleveland & Southwestern, which plan to build to that point. The line will touch French Creek and Dover, and will enter Cleveland via W. Madison Ave.

Paulding, O.—The Westinghouse Electric & Mfg. Co. is reported to be preparing plans and estimates for an electric railway from Wauseon through Napoleon and Defiance to Paulding. The Patrick Hirsch Co., of Toledo, is reported interested.

Cincinnati, O.—The Cincinnati Northern Traction Co. is stated to have secured a site at Lindenwald, near Hamilton, for its proposed new power station, which is to cost $700,000.

A. B. Voorheis, a director of The Cincinnati, Lawranceburg & Arora Traction Co. is reported to have announced that the company is planning to build an extension from Harrison, O., to Batesville, Ind., there to connect with the Indianapolis & Southwestern Traction Co., which will build from Shelbyville to Batesville. The road will not be built this year, however.

Springfield, O.—S. L. Johnson, of New York, N. Y., is reported to be organizing a syndicate for the purpose of acquiring the Springfield & South Charleston line and carrying out the original plan of extending it to Washington C. H. and Chillicothe.

Canton, O.—The promoters of the Canton & Youngstown Ry. are stated to have decided to build a spur line from a point near Congress Lake to Akron, thus giving that place direct connection for Youngstown. The promoters are J. E. Monnet, Milton Shaefferm, J. C. Harmony and others of Canton.

Newark, O.—The Newark & Mt. Vernon Traction Co. is reported incorporated by S. C. Morse, F. A. Crane, A. H. Wilson, Dwight Sapp, F. L. Beam and others. The initial capital is $10,000. The line will extend from Newark to Mt. Vernon, touching Utica and Gambier.

Alliance, O.—The Alliance, Akron & Cleveland R. R. Co. is reported formed by Hugh Bleakley, of Alliance. He proposes to build a line from Alliance to Akron, where connection will be made for Cleveland.

Dayton, O.—It is stated that the traction line which will connect Dayton and Connersville, Ind., will enter from the southwest, and will be known as the Dayton Southwestern Traction Co. Active preparations for the building of the line have already been made.

Gallipolis, O.—Capt. John C. Shepard is reported to be securing right of way for an electric line from Gallipolis to Pt. Pleasant and Pomeroy. He claims to have ample capital to put the project through. He has applied for franchises in Gallipolis.

Shelby, O.—The Sandusky, Norwalk & Mansfield Ry. Co. is stated to have agreed to extend the line from its present terminus at Plymouth, over to Shelby. The extension will give through connection from Mansfield to Sandusky and Cleveland.

Harrisburg, Pa.—The Hagerstown & Waynesboro St. Ry. Co. is stated to have been granted a franchise to build a line over the Waynesboro, Maryland & State Line Turnpike and private right of way from Mason to Waynesboro. W. A. Morgart, Pres., Cumberland, Md. Dir.: J. A. Strite, Jacob S. Lesher, W. Tomwake, John W. Feldman and Roderic Clary. Capital, $25,000.

York, Pa.—The York County Traction Co. is stated to have secured the rights to build two important lines in this county. The one proposed extension is from Red Lion to McCall's Ferry and the other from Hanover to New Oxford, in Adams County.

**Columbus; Pa.*—The Conestoga Traction Co. is stated to have awarded the contract for the erection of their new power plant on Manor St. to John J. Weeber, of Columbus. The building will be of brick 55 ft. x 80 ft. The company has purchased new machinery for the plant.

Houston, Tex.—The Houston Electric Co. states that the Franklin Ave. line will be extended from its present terminus on Engelke St. to the Harrisburg Road, and thence to the city. David Daly, Mgr.

Olympia, Wash.—Two railroad companies are reported to have filed articles of incorporation with the Secy. of State. The Puyallup Valley Traction Co., with a capital of $250,000, with offices at Puyallup, announced the object of building a railway from Puyallup to Tacoma. Incorporators: Fred J. Chamberlain, W. D. Cotter and W. H. Elvins. The other company is the St. Helens Public Service Co., with headquarters at Castle Rock. It purposes to build a line of railroad from that town to the St. Helens mining district, thence to a point on the Columbia River in Clarke County, and a line running south to Portland. The company also announces the object of engaging in electric lighting, etc. The capital is placed at $1,000,000, and Henry W. Coe, L. O'Conner and Joseph O'Neil are the incorporators.

Seattle, Wash.—A franchise to construct and operate a system of street railway lines in the Fremont and Green Lake districts is stated to have been granted to the Seattle Electric Co. by the City Council.

North Yakima, Wash.—Jesse Rose, one of the electric railway promoters, it is reported, has abandoned the idea of building the system of roads out of this city.

Sheboygan, Wis.—The Sheboygan Light, Power & Ry. Co. is reported to be figuring on plans for extensions and new suburban lines. One line will run northwest on the Calumet Road to Cole's Park and Pigeon River.

Brandon, Man.—It is stated that the Kensington-Brandon Development Co. (Mr. Currie, of Toronto, Ont., Vice-Pres.) intends to submit a proposition to the City Council for the establishment of an electric railway.

Winnipeg, Man.—It is reported that the Canadian Pacific Ry. Co. is looking into the question of operating the road between Winnipeg and Ft. William by electric power.

RAILROADS.

Notes Arranged Alphabetically by States.

Eldorado, Ark.—The Chicago & Rock Island R. R. Co. (W. L. Darling, Ch. Engr., Chicago, Ill.) is reported to have purchased the entire stock and bonds of the Arkansas Southern R. R. Co., which extends from Eldorado, 100 miles south to Winnfield. Its connection with the Rock Island lines on the north will be obtained by the construction, now in progress, of the Little Rock & Southern, extending from Trackwood, west of Little Rock, to Crossett, Ark., with a branch to Eldorado, the total length of that road being 143 miles. Part of a proposed 45-mile extension of the Arkansas Southern southward to Alexandria, La., is said to have been completed.

Fairfield, Fla.—The surveying corps of the Gainesville & Gulf Ry., under Ch. Engr. J. W. Patton, of Gainesville, it is stated is about to begin surveying preliminary lines for the extension of the road from Fairfield to Tampa.

Paris, Ill.—It is stated that articles of incorporation of the Central Illinois R. R. Co., have been filed. The terminals of the proposed road are Roadhouse and Paris, and the line, the construction of which is to begin at once, it is reported, will pass through Greene, Morgan, Sangamon, Christian, Shelby, Moultrie, Coles and Edgar counties. The capital stock of the company, the main office of which is in Chicago, is $50,000. The incorporators are: Arthur W. Underwood, Nathan S. Smyser, M. S. Somerville and others, all of Chicago.

Mason City, Ia.—The new line southeast from Mason City, in which Messrs. Brice and Cass are reported interested, and in which is involved the consolidation of 2 electric lines of Mason City and Waterloo, it is stated, will be a steam road and not an electric line, as reported.

Crowley, La.—A party under Louis Depuy, it is reported, has been engaged in securing rights of way for the projecting Opelousas, Gulf and Northeastern R. R., which will run from Crowley via Rayne and Opelousas, to Melville. It is stated that the right of way has been secured between Crowley and Rayne, and from Rayne as far north as Branch. It is announced that construction will begin as soon as the general quarantine is lifted.

Boston, Mass.—It is stated that an expenditure of $10,000,000 for extensive improvements on the entire system is contemplated by the Boston & Maine R. R. (H. Bissell, Ch. Engr.).

Huntsville, Mass.—The business men, of Huntsville, it is stated, will accept the proposition of Pres. John R. Connor, of the Nashville & Huntsville R. R., and subscribe $125,000 of the capital stock if the railroad from the South is guaranteed.

Miami, Mo.—The Central Ry. Co., of Kansas City, with a capital of $1,500,000, it is stated, has been incorporated. The road is to be 50 miles long and is to extend from Miami, in Saline county, to Sedalia, in Pettis county. The stockholders include W. E. McCulley, Macon: T. J. O'Donnell, Kansas City; W. H. Smith, New York, N. Y., and others.

Manila, P. I.—Later reports state that the time for receiving bids at Manila for the construction of the Philippine railways, has been extended to Dec. 15. The construction, it is stated, will approximate about 1,000 miles.

Philadelphia, Pa.—Directors of the Baltimore & Ohio R. R., it is reported, have appropriated $650,000 for increased facilities in this city, and improvements estimated at $7,000,000 have been authorized all along the line, with the order that the work be started at once. The company will build new shops here to replace the present small freight accommodations, and make extensive freight terminal betterments. D. D. Carothers, Ch. Engr., Baltimore, Md.

**Morristown, Tenn.*—Wm. J. Oliver, of Knoxville, is reported to have secured the contract for double-tracking the Southern Ry. from Morristown to Knoxville and the building of a branch line from Chattanooga to Stephenson, all in Tennessee. Total cost reported to be $1,000,000.

Sour Lake, Tex.—Surveys are being made, according to reports, for the extension of the Beaumont, Sour Lake & Western R. R., from Sour Lake to Houston (G. W. Meeker, Pres., Beaumont).

**Stockdale, Tex.*—A. V. Kellog, of Houston, Engr. M. of W. of the Galveston, Harrisburg & San Antonio R. R., it is reported has announced that the contract for the construction of the San Antonio & Gulf extension from Stockdale to Cuero, in all about 47 miles (bids received Aug. 26), has been awarded to W. O. Robertson, of San Antonio, for the entire construction of the line, which will connect the San Antonio & Gulf Shore road with the Gulf, West Texas and Pacific, giving a direct line from San Antonio to Port Lavaca.

Garfield, Wash.—The Spokane & Inland R. R. (C. E. Averill, Secy.) has appointed a committee, of which J. A. Dix is a member, to secure options on property for right of way through which the road will be built and also to secure a location for depot grounds.

Mexico.—Consul Albert R. Morawetz, at Nogales, Mexico, has reported to the State Dept. at Washington. D. C., that the Mexican government has granted a concession to an American company to build a railway from Alamos, Sonora, to Guadalajara, in the State of Jalisco. The length of the road is 745 miles, and it must be completed within 7 years. The total cost is estimated at $25,000,000.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

Washington, D. C.—See "Miscellaneous."

Chicago, Ill.—The Trus. of the Illinois Charitable Eye and Ear Infirmary, it is stated, have secured a site on Peoria St., adjoining the infirmary, on which it is proposed erecting an addition with the $50,000 recently appropriated by the Legislature.

Plans have been prepared by D. H. Burnham & Co., Ry. Exch. Bldg., for a field house to be erected in Washington Park, of pressed brick and terra cotta, with tile roof, and cost $100,000.

Indianapolis, Ind.—Bids will be received until Sept. 20 by the Bd. Pub. Wks. (M. A. Downing, Pres.) for furnishing materials and erecting a public bath house at Madison Ave.

Vincennes, Ind.—The Co. Comrs., it is reported, have appropriated $25,000 for the erection or a county hospital.

Kentland, Ind.—The Co. Council, it is reported, has authorized an issue of $24,000 bonds to erect a court house.

**Barnstable, Mass.*—E. L. Sampson, of Plymouth, is stated to have secured the contract for constructing additions to the court house at Barnstable, for $28,000.

Salem, Mass.—Plans and specifications will be received until Nov. 1 at the office of Jere. T. Mahoney, Register of Probate Court, for a fireproof building for the Registry of Deeds for the Southern Dist. of the Co. of Essex, and for the Probate Court for said Co., including the Registry of Probate and Insolvency, to cost about $240,000.

Minneapolis, Minn.—Rev. S. R. Tollefsen, it is stated, is contemplating the erection of a Norwegian Hospital at a cost of $50,000.

Kansas City, Mo.—The city, it is reported, will erect 3 municipal buildings between 19th and 20th Sts. The total cost to be $70,000. Address City Clk.

Items marked thus give the names of parties awarded contracts.

**Lincoln, Neb.*—A. J. Archambo, of Minneapolis, Minn., has secured the contract for the ventilating and heating apparatus for the U. S. Post-Office and Court House (bids opened Aug. 24) for $14,500.

Overbrook, N. J.—The Pub. Bldg. Com. of the Bd. of Freeholders, it is stated, has approved the plans of Hurd & Sutton, 763 Broad St., for the proposed buildings to be added to the county's branch hospital for the insane at Overbrook. The approximate cost to be $1,250,000. There are to be 7 buildings, including an administration building and a hospital for contagious diseases.

**Jersey City, N. J.*—The Bd. City Hospital Trus., it is stated, has awarded the contracts to erect the new City Hospital at Montgomery St. and Baldwin Ave. (bids for which were received Sept. 7) as follows: To M. T. Connolly Contr. Co., 237 17th St., mason, terra cotta, marble, carpenter, roofing and metal work, structural steel and ornamental iron work, etc., at $129,000; Watson-Flagg Eng. Co., 27 Thames St., New York, N. Y., electric work, $9,475; T. Rutzler Co., 127 and 129 White St., New York, N. Y., heating and ventilating, $18,040; John K. Parker Co., 225 4th Ave., New York, N. Y., plumbing, water supply, and gas fitting, $17,000, and National Electric Co., 400 W. 23d St., New York, N. Y., elevators, $3,000.

The Bd. of Finance, it is stated, has appointed Geo. W. Von Arx, 15 Exchange Pl., to prepare plans for new No. 7 Truck House on Irving St., and Louis H. Broome, 15 Exchange Pl., to prepare plans for new No. 17 engine house in the W. Bergen section.

Summit, N. J.—Plans are being prepared, according to reports, for a hospital to be erected here, at a cost of $20,000. Dr. Wm. H. Lawrence is reported interested.

**Somerville, N. J.*—The Clerk Bd. of Chosen Freeholders writes that the contract for erecting a jail for Somerset County has been awarded as follows: for structure to Richards & Gaston, of Raritan, for $23,806, and iron and cell work to the Pauly Jail Bldg. Co., of St. Louis, Mo., for $22,800. Architects, Gordon, Tracy & Swartwout, 156 5th Ave., New York, N. Y.

New York, N. Y.—Bids will be received until Sept. 22 by Wm. McAdoo, Police Comr., for installing new steam boiler and heating system at the 2d, 21st, 24th, 25th, 26th and 79th Sub-Precinct Police Stations; also furnishing materials, making repairs, alterations, etc., at 24th and 35th Precinct Stations, all in City of New York.

Bids will be received until Sept. 21 by the Comrs. of Parks (John J. Pallas, Pres.) for furnishing materials and erecting a feed barn in the New York Zoological Park, in Bronx Park, City of New York.

Bids will be received until Sept. 25 by the Dept. Pub. Charities (Jas. H. Tully, Comr.) for furnishing materials and steam heating the new male dormitory at the Metropolitan Hospital, Blackwell's Island.

Utica, N. Y.—See "Power Plants, Gas and Electricity."

Gowanda, N. Y.—See "Miscellaneous."

Syracuse, N. Y.—The Municipal Htg. Co., it is stated, submitted the only bid for heating the City Hall, at $4,482.

Fargo, N. D.—M. E. Beebe, of Fargo, it is stated, has been engaged to prepare plans for a 2-story and basement city hall.

Philadelphia, Pa.—It is stated that revised plans are to be prepared by Savery, Scheetz & Savery, Stephen Girard Bldg., for the library building which is to be erected by the Pennsylvania Historical Society, at 13 and Locust Sts. The building is to be a 4-story fireproof structure, 80 x 60 ft.

Williamsport, Pa.—E. V. Seeler, Real Estate Trust Co. Bldg., Philadelphia, is reported to have prepared plans for a library, to be erected in Williamsport, for $125,000.

Newport, R. I.—Bids will be received until Sept. 19 at the Bureau Supplies and Accounts, Navy Dept., Washington, D. C., to furnish at the naval training station, Newport, a quantity of concrete or yellow pine conduit and steam mains and to construct extension to boiler house. H. T. B. Harris, Paymaster-Gen., U. S. N.

Mitchell, S. D.—Bids will be received until Sept. 27 by J. G. Markham, City Aud., for erecting a building.

**Midland, Tex.*—It is reported that Wm. Martin, of Comanche, has secured the contract to erect the court house at $26,000.

Vancouver Barracks, Wash.—Bids will be received by the Construction Q. M., on Oct. 18, for the construction, including plumbing, heating and electric wiring buildings at this post, as advertised in The Engineering Record.

Milwaukee, Wis.—A Polish orphanage, costing $50,000, it is stated, is to be erected here next spring. Father Gulski may be able to give further information.

The Hague, Holland.—It is reported that an invitation has been issued to architects of all nations to submit plans for the Peace Palace for the use of the Permanent Court of Arbitration at the Hague. There are to be 2 buildings, one a library and the other a court house. The cost is to be about $640,000. Thos. E. Collcutt, Chmn. Bd. Directors Carnegie Foundation, London, Eng., and Prof. W. R. Ware, of Columbia Univ., N. Y. City, it is stated, are members of the committee appointed to pass upon the merits of the plans.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

**Birmingham, Ala.*—Evans Bros. Constr. Co. is reported to have received the contract for erecting a 5-story store building here, at a cost of $70,000.

Birmingham, Ala.—The plans of P. Thornton Mayre, of Atlanta, Ga., it is stated, have been accepted for the 2-story fireproof brick, stone and terra cotta terminal station which is to be erected here by the Birmingham Terminal Co., at a cost of about $1,000,000.

Seward, Alaska.—Breiting & Buchinger, of Seattle, Wash., it is reported, are preparing plans for a bank, to be erected here at a cost of $60,000.

Batesville, Ark.—Bids will be received until Sept. 20 by the Bldg. Com. (J. W. Case, Chmn.) for erecting a 2½-story, brick-veneered, slate-roofed building, an annex to the I. O. O. F. Widows' and Orphans' Home, in this city.

Denver, Colo.—It is stated that the Colorado & Southern Ry. (J. M. Herbert, Gen. Mgr., Dallas) will erect a $500,000 depot in this city.

**Jacksonville, Fla.*—Owens & Sons are stated to have received the contract for erecting an addition to the building of the Florida Bank & Trust Co., at $100,000.

Lebanon, Ill.—The Geo. E. Remick Sanitarium Co. is reported incorporated with a capital of $250,000, for the erection of a sanitarium. Geo. E. Remick, of East St. Louis, is reported interested.

Chicago, Ill.—A building permit has been granted to G. W. and S. A. Higgins to erect three 3-story brick stores and flats at 1478 Kedzie Ave., 2231 Milwaukee Ave. and 1941 Logan Sq., at a total cost of $100,000.

The erection of a $100,000 Masonic Temple on the west side, probable at Ashland Boule. and Madison St., is said to be contemplated by the several chapters of the Royal Arch Masons.

Ogden, Sheldon & Co., it is reported, will erect a 6-story warehouse at Michigan, St. Clair and Illinois Sts., at a cost of $200,000. It is to be equipped with freight elevators operated by electricity.

Zion City, Ill.—It is stated that the Chicago, Milwaukee Electric Ry. Co. (S. A. Jennings, Ch. Engr., Highwood) will erect a station in Zion City at a cost of $35.000.

Monmouth, Ill.—Bids will be received until Sept. 25 by the Monmouth Hotel Co. for erecting (not including heating and plumbing) a 56-room hotel. Herbert Edmund Hewitt, archt., 22 Arcade Bldg., Peoria. Ill.; address J. D. Diffenbaugh, Monmouth.

Clarinda, Ia.—It is stated that a depot will be erected here, at a cost of $16,000.

Des Moines, Ia.—It is stated that plans are being prepared for remodeling the Marquardt Savings Bank building at 5th and Locust Sts., at a cost of about $35,000.

Mason City, Ia.—The Iowa Odd Fellows Orphans' Home, which was destroyed by fire recently, it is reported, will be rebuilt at once.

Sioux City, Ia.—It is stated that the Massachusetts Real Estate Co. has decided to replace the Massachusetts block at 4th and Jackson Sts. with a brick structure at an estimated cost of $120,000.

M. L. Flinn, agent for the American Realty Co., in Sioux City, it is stated, will erect a theatre at 6th and Pierce Sts., to cost about $100,000.

New Orleans, La.—The Canal-Louisiana Bank & Trust Co., it is reported, is contemplating the erection of an office building at Gravier and Camp Sts.

Cottage City, Mass.—Herbert Chase is said to be interested in a company who will erect an addition to the present Wesley House at a cost of $55,000.

Grand Rapids, Mich.—The White Publishing Co., it is reported, will erect a 3-story fireproof building to cost $30,000.

Detroit, Mich.—The Detroit Hotel Co. is reported organized with a capital of $1,200,000, for the erection of a hotel. Incorporators:: W. C. and P. H. McMillan, Frank H. Clark and L. Dean Holden.

**Minneapolis, Minn.*—Butler Bros., of St. Paul., it is stated, have received the contract to erect a fireproof reinforced concrete steel cold storage warehouse for A. Booth & Co., at a cost of about $125,000.

**Duluth, Minn.*—The contract for the 7-story brick and stone, 50 x 150-ft. wholesale building, to be erected on 5th Ave., W., for the Leithhead Drug Co., it is stated, has been awarded to McLeod & Smith, of Duluth, at about $53,000.

St. Louis, Mo.—It is stated that bids will be received until Sept. 21 by Frank Hueser, 2027 Washington St., for erecting a 2-story addition to a hotel at Sarah and Olive Sts. Cost, $25,000.

Springfield, Mo.—It is stated that plans have been prepared for a Masonic temple, to be erected here, at a cost of $65,000.

**Salem Depot, N. H.*—The contract for the buildings at the new race track at Salem Depot, it is reported, has been awarded to Head & Dowst Co., of Manchester, at about $200,000.

New York, N. Y.—It is stated that a 10-story loft building, to cost $300,000, is to be erected at 66 to 72 Lafayette St., by a syndicate organized by Israel Lippmann. Schwartz & Gross, 35 W. 21st St., are the archts.

Grand Forks, N. D.—It is stated that a building is to be erected at 4th St. and Kittson Ave. for the International Harvester Co., at a cost of about $60,000. J. F. Peterson, of Chicago, Ill., may be able to give further information.

Columbus, O.—It is reported that the Columbus Interurban Terminal Co. is about to be formed for the purpose of erecting a 6-story union passenger and freight station for the interurban lines. Jas. Williams, Ch. Engr. Columbus, Delaware & Marion Electric Ry. Co., at Delaware, may be able to give further information.

Cleveland, O.—J. W. Holcomb, it is stated, has secured a site on Prospect St., and intends erecting a $50,000 building. It is reported that no plans have been prepared as yet.

**Philadelphia, Pa.*—A building permit has been granted to Ballinger & Perrot, 1200 Chestnut St., to erect a 5-story brick factory at American and Willow Sts., to cost $20,000.

Ballinger & Perrot, 1200 Chestnut St., it is stated, have completed plans and will receive bids until Sept. 20 for the erection of a 5-story brick, granite and Indiana limestone warehouse, which is to be erected at 2d and Wildey Sts.

The Philadelphia Electric Co., it is stated, is about to begin the construction of a $250,000 10-story and basement office building. Jas. H. Windrim, 1107 Walnut St., is the Archt., and may be able to give further information regarding bids for same.

McKeesport, Pa.—It is reported that the Watson Paint & Glass Co. has secured a site and intends erecting a 4-story warehouse, to cost $15,000.

**Pittsburg, Pa.*—H. L. Kreusler, 3301 Penn Ave., it is reported, has received the contract to erect the Leopold Vilsack warehouse in 3d Ave. It is to be an 8-story structure, 45 x 160 ft., and is to cost $150,000. F. J. Osterling, Times Bldg., is the Archt.

Scranton, Pa.—C. H. Davis, Connell Bldg., is the Archt. for a brick store which is to be erected for Clarke Bros., at a cost of $20,000.

Mt. Gretna, Pa.—Abner A. Richter, Shenk Bldg., is reported to be preparing plans for a hotel to be erected here, at a probable cost of $40,000. A. D. Smith, of Cornwall & Lebanon R. R. Co., is reported interested.

**Sioux Falls, S. D.*—The Masonic Temple Assoc. is stated to have opened the following bids on Sept. 2 for erecting a temple on 10th St.: C. D. Lepper & Co., $40,500; Thos. McKinnon, $42,000; Anton Ristad, $44,375; T. N. Ross, $40,640, and J. J. Olsen, of Red Wing, Minn., $37,913 (awarded contract).

**Memphis, Tenn.*—The C. J. Wagner Lumber & Improvement Co., Planters' Insurance Bldg., is stated to have received the contract for erecting the Linden station, at $200,000.

*The contract for erecting the Italian Society Bldg. is reported to have been awarded to E. M. Apperson for about $25,000.

Plans are reported to have been prepared by Shaw & Pfell, Planters Bldg., for alterations to the Planters' Insurance building, at a cost of $75,000. The contract will soon be let, according to reports.

Knoxville, Tenn.—The Supreme Commandery of the United Order of the Golden Cross is stated to have purchased a site on Prince St., for the erection of a 4-story brick office building, at a cost of $50,000.

**Dallas, Tex.*—Chrisman & Nesbitt, it is stated, have secured the contract to erect a 4-story building, 50 x 110 ft., for the Texas Seed & Floral Co., at about $14,465.

Bennington, Vt.—It is reported that the erection of a $1,000,000 hotel here is under consideration.

North Yakima, Wash.—W. Crocker, Deputy County Aud., writes that all bids opened Sept. 4 for the erection of a fireproof court house have been rejected. New bids will be received.

Seattle, Wash.—A. W. Gould is reported to be preparing plans for a 12-story, 108 x 120-ft. office building, to be erected at 2d Ave. and Marion St., for Henry Boyle, of San Rafael, Cal., at an estimated cost of $540,000.

It is reported that Thompson & Thompson, D. H. Bank Bldg., are preparing plans for a 3-story family hotel, to cost $20,000.

Spokane, Wash.—Albert Held, Hyde Blk., is preparing plans for a terminal station for the Coeur d'Alene & Spokane R. R. Co., to cost about $40,000.

Cutter & Malgren, Exchange Bldg., are preparing plans for a 4-story office building for the Washington Water Power Co., to cost about $60,000.

New York, N. Y.

146 Sullivan St., 6-story br. and stone store and tenemt.; c, $22,000; o, Silverman & Bloch; a, Horenburger & Straub.

371 E. 4th St., 7-story br. and stone shop; c, $50,000; o, Horowitz Bros. & Marzareten; a, Bernstein & Bernstein.

2d Ave .and 50th St., 6-story br. and stone store and tenemt.; c, $45,000; O, David Lenten; a, Geo. F. Pelham.

69th St. and Ave. A., 3 6-story br. and stone stores and tenemts.; total c, $135,000; o, David Levin; a, E. H. Meyers.

100th St. and 1st Ave., 9 6-story br. and stone stores and tenemts.; total c, $432,000; o, C. & H. Friedman; a, Saml. Sass.

1685 1st Ave., 6-story br. and stone store and tenemt.; c, $40,000; o, Katz & Wimpie; a, Bernstein & Bernstein.

131st St. and Amsterdam Ave., 6-story br. and stone store and tenemt.; c, $50,000; o, Wolf & Goldman; a, Bernstein & Bernstein.

Rose St. and Brook Ave., 6-story br. stores and tenemt.; c, $65,000; o, Emma M. C. Mestaniz; a, Harry T. Howell.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

**Boise, Idaho.*—Chas. Blumgran & Co., it is reported, have received the contract for the excavating and foundation work of St. John's Church at $13,700.

Hyde Park, Ill.—Norman P. Cummings, it is stated, has had plans prepared by Henry L. Newhouse, 4530 Prairie Ave., Chicago, for a 3-story apartment house, 150 x 225 ft., to be erected on Lake Ave., near 47th St., at a cost of about $200,000.

Chicago, Ill.—A. H. Lowden, 90 Washington St., is the architect for a church which is to be built at 8700 Aberdeen St. for St. Kilian's R. C. congregation. It will be a brick and stone structure, 102 x 58 ft., with slate roof, and cost about $50,000.

Robt. S. Smith has completed plans for an apartment which Jas. W. Eastland will build at the intersection of Clarendon, Graceland, and Evanston Aves., at a cost of $80,000.

A 3-story brick and stone, 100 x 150-ft. apartment house is to be erected at Monroe Ave. and 64th St. by Louis C. Wagner at a cost of $150,000.

Riverside, Ia.—It is stated that bids will be received until Jan. 15 for erecting the superstructure of a $40.000 church for the St. Mary's congregation. Martin Heer, Archt., Dubuque.

Baltimore, Md.—It is reported that preliminary plans have been prepared for a stone edifice to be erected for the congregation of the Garret Park M. E. Church at Lexington and Monroe Sts., at a cost of about $25,000. Rev. W. S. Wright, Pastor. E. O. Preston, Chmn. Bldg. Com.

Detroit, Mich.—Harry J. Rill, 54 Buhl Blk., it is stated, has prepared plans for a 2-story and basement brick and stone church and school for the Blessed Sacrament congregation (Rev. J. J. Connolly, Pastor)), to be erected on Belmont Ave., near Woodward Ave. Estimated cost, $22,000.

St. Louis, Mo.—It is stated that bids will be received until Sept. 20 by J. J. Robinson, Archt., 6766 Vernon Ave., for erecting a 2-story church to cost $50,000.

New York, N. Y.—Plans have been filed for a 5-story brick and stone church and parish house, to be erected at 114th St. and 1st Ave., for New York City Church, Extension and Missionary Society of the M. E. Church, at a cost of $60,000. Cady & See, Archts., 6 W. 22d St.

**Items marked thus give the names of parties awarded contracts.*

Newark, N. J.—Warrington G. Lawrence, New York, N. Y., it is stated, has prepared plans for a 3-story and basement brick and stone residence which is to be erected at High and Longworth Sts. for Mrs. Christian Feigenspan at a cost of $55,000.

Wilmington, N. C.—It is stated that bids are wanted until about Dec. 1 for erecting a 5-story brick and terra cotta apartment house. A hot-water heating plant, gas and electric lights and electric passenger elevator will be installed; probable cost, $40,000. H. E. Bonitz, Archt., 15 Princess St.

**Columbus, O.*—It is reported that John Rouzer Co. has secured the contract to erect the First M. E. Church at $44,840.

Lorain, O.—E. M. Ulrich, of Cleveland, O., it is reported, is the Archt. for the new edifice which is to be erected for the congregation of St. Ladislas Church in South Lorain, at a cost of $20,000.

**Homestead, Pa.*—Harris & Davis, of Pittsburg, it is reported, have received the contract to erect the St. Francis German R. C. Church at $50,000.

**Philadelphia, Pa.*—Building permits have been issued as follows: to Chas. Yundt, 2108 N. 6th St., to erect a 3-story stone and frame dwelling, 32x32ft., at 3d and Tabor sts., to cost $45,000, and to J. E. & A. L. Pennock, 1004 Land Title Bldg., to erect a 3-story brick and stone dwelling 11x42 ft., at Springfield Ave. and Huroy St., to cost $60,000.

Pittsburg, Pa.—J. P. McKinney, of the McKinney Mfg. Co., is reported to have had plans prepared for a residence, to be erected here, at a cost of $60,000.

*Calhoun & Miller, 4213 Sherman St., it is stated, have secured the contract to erect a brick and stone residence for Jos. H. Vilsack, at Negley Ave. and Bryant St., to cost $40,000.

West Pittston, Pa.—E. H. Davis, Connell Bldg., Scranton, is the Archt. for a residence to be erected for Wm. Shiffer, at West Pittston, to cost $15,000.

Memphis, Tenn.—L. M. Weathers & Co. Cotton Exchange Bldg., are reported to be preparing plans for an addition to be erected to the St. Mary's Cathedral, at a cost of $30,000.

**Sherman, Tex.*—The Southwestern Constr. Co., it is reported, has secured the contract to erect a R. C. Church here for $16,000.

Superior, Wis.—It is stated that a stone cathedral is to be erected for Bishop Schinner's diocese to cost about $125,000.

Milwaukee, Wis.—The congregation of the English Lutheran Church of the Epiphany, it is stated, intends erecting a stone church at Clarke and 2d Sts., to cost $20,000.

Winnipeg, Man.—It is stated that the English Lutheran congregation has decided to erect a chapel here to cost $50,000.

New York, N. Y.

51st St. and 1st Ave., 2 6-story br. and stone tenemts.; c, $80,000; o, John H. Myer; a, Horenburger & Straub.

51st St. and 5th Ave., 5-story br. and stone residence; c, $65,000; o, E. R. Morse; a, Ogden Codman.

79th St. and Madison Ave., 5-story br. and stone residence; c, $75,000; o, J. C. Lyons Bldg. & Operating Co.; a, Buchman & Fox.

1st Ave. and 118th St., 6-story br. and stone tenemt.; c, $50,000; o, Saul Wallenstein; a, Bernstein & Bernstein.

Lexington Ave. and 123d St., 2 6-story br. and stone tenemts.; total c, $110,000; o, Julius Weinstein; a, Bernstein & Bernstein.

163d St. and Amsterdam Ave., 2 6-story br. and stone tenemts.; total c, 80,000; o, Chas. and Henry Friedman; a, Bernstein & Bernstein.

186th St. and Nicholas Ave., 2 5-story br. and stone tenemts.; c, $100,000; o, Stephen J. Egan; a, Harry T. Howell.

Bway and 159th St., 5-story br. and stone tenemt.; c, $75,000; o, Fluri Constr. Co.; a, Moore & Landsiedel.

Bway and 142d St., 6-story br. and stone tenemt.; c, $45,000; o, C. R. McLoughlin; a, C. B. Brun.

Park Ave. and 171st St., 5-story br. tenemt.; c, $35,000; o, Danzig Krakauer & Markowitz; a, Samuel Sass.

River Ave. and Battners Lane, Riverdale, 3-story br. dwell.; c, $35,000; o, Mrs. Henry Boettger; a, Reiley & Steinback.

61st St. and Madison Ave., alterations to 4-story br. and stone residence; c, $20,000; o, J. C. Lyons Bldg. & Operating Co.; a, Buchman & Fox.

249th St. and Sycamore St., alterations to 3-story br. dwelling; c, $70,000; o, Geo. W. Perkins; a, Heins & La Farge.

SCHOOLS.

Notes Arranged Alphabetically by States.

San Pedro, Cal.—F. S. Allen, of Pasadena, it is stated, has been engaged to prepare plans for the high school, to cost $100,000, and also for a 4-room school.

San Francisco, Cal.—All bids recently received for the Washington Grammar School, it is stated, have been rejected and according to reports new bids are again to be received, to be submitted separately on the different portions of the work. Appropriation, $119,000. Address Bd. Pub. Wks.

Bids will be received until Oct. 16 by the Bd. Trus., State Normal School (S. C. Denson, Chmn.) for erecting said building; bids to be submitted separately on the following: Masonry work, including all brick, stone, terra cotta and concrete work and all necessary excav. and fill.; iron work, carpentry, plastering, electric and glazing work; plumbing and gas fitting; ventilating and heating; tinning, galvanized iron and slating work. Stone & Smith, Archts., 1109 James Flood Bldg.

**Selma, Cal.*—The contract for erecting the West Side school, it is reported, has been awarded to Soderberg, Johnson & Olsen, at about $14,794.

Breen, Colo.—Bids will be received by Wm. M. Peterson, Supt. U. S. Indian School, for furnishing and delivering at said school about 84,000 bricks, 2,650 cu. ft. stone, 396 yds. excav., 40,000 ft. lumber, 46 squares tin roofing, etc.

Hartford, Conn.—It is stated that a 3-story, 67 x 121-ft. brick school will soon be erected at Broad and Ward Sts. for the Immaculate Conception Parish. Rev. M. A. Sullivan is reported interested.

Washington, D. C.—The following are the bids opened on Sept. 12 by the Bureau of Supplies and Accounts, Navy Dept., Washington, D. C., for the construction of a power house on the grounds of the U. S. Naval Medical School, Washington. Chas. D. Collins, Washington (2 bids) $13,792 and $13,300, and A. B. Stannard, New York, N. Y. (5 bids) $17,300 to $18,938.

Gainesville, Fla.—Bids will be received until Oct. 15 by the Educational Bond Trus. (Chris Matheson, Secy.) for $50,000 bonds.

**Tifton, Ga.*—See "Water."

Muncie, Ind.—It is reported that plans are being prepared for the erection of a building for the Indiana Normal School, to cost $35,000.

Cascade, Ia.—It is reported that a parochial school is to be erected to cost $20,000. Rev. L. Roche, pastor of St. Martins Church, can give information.

**Lyons, Ia.*—It is stated that the following are the bids received Sept. 2 for erecting the high school: Marcus M. Hall, Cedar Rapids, $30,931 (awarded contract); H. Eilenberger, Chicago, Ill., $31,593; Anton Zwack, Dubuque, $32,700; Groff & Derr, La Crosse, Wis., $32,988; Loomis Bros., Cedar Rapids, $33,260; Bartlett & Kling, Cedar Rapids, $33,333; F. M. Garthwaite, Chicago, Ill., $33,619; John F. Schmidt Bros. Co., Chicago, Ill., $34,482; John W. Evans' Sons Co., Bloomington, $34,800; Dan Haring, Clinton, $34,865, and John Lake & Sons, Clinton, $35,881.

Fairfield, Ia.—H. R. Holsman is the Archt., according to reports, for the library which is to be erected at Parsons College, at a cost of $25,000. R. D. Foster, Secy. Bldg. Comn.

Pottawatomie, Kan.—Bids will be received by F. E. Leupp, Comr. Indian Affairs, Dept. Interior, Washington, D. C., until Oct. 2 for furnishing materials and erecting a laundry building at Pottawatomie school; for further particulars address Geo. L. Williams, Supt., Hoyt.

Holyoke, Mass.—It is reported that the Bd. Pub. Wks. will soon ask bids for erecting the school in Ward 2.

Mt. Pleasant, Mich.—Bids will be received by Robt. A. Cochran, Supt. U. S. Indian School, for furnishing and delivering at said school about 246 sacks cement, 169 yds. sand gravel, galvanized pipe, metal roofing, brick, etc.

Minneapolis, Minn.—C. D. Decker, Purchasing Agent of the University of Minn., writes that it is proposed to erect a hospital at a cost of $125,000, it being a gift of Mrs. Mary A. Elliott of California (deceased). No architect selected as yet.

**Cloquet, Minn.*—Ingermann Bros., of St. Paul, it is reported, have received the contract to erect the high school at $30,194, and Pond & Hasey Co., of Minneapolis, it is stated, has secured the contract for the plumbing and ventilating of same at $6,490.

**Kansas City, Mo.*—The Bd. of Educ., it is stated, has awarded the contract for installing a steam heating apparatus in the Attucks School, to the Lewis & Kitchen Steam Htg. Co., Bway and 9th Sts., at $4,826, and the contract for plumbing same to M. H. Joergans, 415 E. 15th St., at $3,237. The contract for erecting an addition to Adams School, it is stated, has been awarded to A. E. Medorie at $17,297.

Browning, Mont.—Bids will be received until Oct. 5 by the Comr. Indian Affairs, Washington, D. C., for furnishing materials and constructing an employes' quarters and a day school at Blackfeet Reservation; for further information apply to Capt. J. Z. Dare, U. S. Indian Agent, Browning.

Berlin, N. H.—A resolution has passed the City Council appropriating $15,000 to erect a grade school.

Orange, N. J.—It is reported that all bids received Aug. 30 for erecting the school at Main and Cleveland Sts. exceed the appropriation, and the plans will have to be revised.

Santa Fe, N. M.—W. D. Lovel, of Minneapolis, Minn., it is reported, submitted the lowest bid on Aug. 22 for erecting a dormitory at the Santa Fe Indian School at $38,438.

**New York, N. Y.*—The following are the bids opened on Sept. 11 by C. B. J. Snyder, Supt. School Bldgs., for installing, ventilating and heating apparatus in School 38, Boro of Manhattan: United Htg. Co., $37,597; Jas. Curran Mfg. Co., $35,500; Dowdeswell Bros., $36,588; Frank Dobson, $36,940; E. Rutzler Co., $35,867; Rossman & Bracken Co., 132 E. 42d St., $35,250 (awarded contract), Walker & Chambers, $36,242.

*Wm. Werner, 894 Forest Ave., Bronx Boro., secured the contract for constructing iron stairs on School 17, Manhattan Boro. (bids opened Sept. 11) for $5,560.

Bids will be received until Sept. 25 by C. B. J. Snyder, Supt. School Bldgs., for the sanitary work and gas fitting in addition to School No. 10, Boro. Bronx; new stairways and general alterations at School No. 41, Boro. Brooklyn; installing ventilating and heating apparatus in addition to School No. 1, and for the general construction, plumbing, drainage, etc., in addition to School 78, Boro. Queens.

**Long Island City, L. I., N. Y.*—The following are the bids opened on Sept. 11 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for sanitary work and gas fitting of addition to and alterations in school 1, Queens Boro.: Nicholas Nehrbauer, Jr., $12,463; Rossman & Bracken Co., $13,800; Wm. C. Ormond, $11,970; Jas. Harley, $14,441; Frank J. Fee, $11,400; Jas. Fay's Son, 205 E. 51st St., N. Y. City, $10,732 (awarded contract), Chris. Nally, $12,094.

Perry, N. Y.—F. W. Kirkland, of Rome, is preparing plans for a $50,000 school for Perry. L. N. Wyckoff, Pres. Bd. Educ.

Fargo, N. D.—It is reported that bids are wanted until about Sept. 20 for a 3-story brick science hall for Fargo College; probable cost, $30,000. Hancock Bros., archts.

Cleveland, O.—Emile M. Uhlrich, 1328 Schofield Bldg., is preparing plans for a school to be erected on Scranton Ave. for St. Michaels Church, to cost about $100,000. Bids will be received about Mar. 15. Rev. Jos. Koudelka, Pastor.

Philadelphia, Pa.—Cope & Stewardson, 320 Walnut St., are the architects for the new Veterinary School for the University of Pennsylvania.

*Geo. F. Payne & Co., 401 S. Juniper St., have secured a permit to repair the Logan Hall for the Univ. of Pennsylvania at a cost of $18,000.

Flandreau, S. D.—Bids will be received by Chas. F. Peirce, U. S. Indian School, for furnishing and delivering at said school about 25,600 ft. lumber, 31,000 shingles, 87 squares metal roofing, 454 ft. radiation, etc.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Bridgeport, Conn.—Bids will be received until Oct. 10 by the Bd. Health (Elmer F. Blank, M. D., Pres.) for the collection of garbage, offal and dead animals, for a term of 10 years, beginning Nov. 8, 1905.

**Indianapolis, Ind.*—The contract for the collection and removal of the ashes of the city is stated to have been awarded on Sept. 4 by the Bd. of Pub. Wks. to Hiram W. Miller and Edw. J. Robison, at $23,500 per yr.

Davenport, Ia.—W. B. Wright is reported to have presented to the Bd. of Health and City Council a proposition to install a garbage crematory.

New Orleans, La.—At a meeting of the Committee on Police and Public Buildings on Sept. 7, the Clerk was authorized to prepare an ordinance providing for the sale of a garbage franchise, bids to be in about Nov. 1.

Philadelphia, Pa.—It has been decided to receive new bids until Sept. 18 for street cleaning for the year 1906. Saml. Sutcliffe, Ch. Bureau Street Cleaning.

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

Philadelphia (Miss.) Compress, Electric Light & Ice Mfg. Co. has purchased a new compress, and is in the market for electric light plant and ice plant.

Mayo & Son, Foxcroft, Me., will build an addition to their mill consisting of 2-story building measuring 40x50 ft. A new boiler plant will be erected in the near future and the company will be in the market for two boilers of 125-h.p. capacity each.

Beacon Mfg. Co., New Bedford, Mass., intends increasing the capacity of its present plant.

Wm. Schollhorn Co., New Haven, Conn., will build a 5-story addition to its present plant measuring 100x40 ft. A new boiler plant will be installed. Capacity not yet determined.

Hedrick, Foust & Beck, owners of the Dixie Milling Co., High Point, N. C., are planning to erect a new roller mill, and are in the market for a 40-h.p. engine and 50-h.p. boiler.

The Quaker Marble Co., Friendsville, Tenn., is making plans for the opening of its marble quarries near Friendsville. Power plant of about 100-h.p. will be required.

Rhode Island Co., Spray, N. C., is contemplating the erection of an addition to its present plant to measure 203x125 ft. and accommodate 5,000 spindles and 200 looms. Present steam plant will be replaced by larger plant, to have a capacity of 500 h.p.

Piedmont Buggy Co., Monroe, N. C., is contemplating enlarging its plant during the coming year.

The Perry Knitting Co., Perry, N. Y., will build an addition to its yarn mill and will install a large number of new spindles.

The Mihalovitch, Fletcher Co., Cincinnati, O., is building a new plant, measuring 50x175 ft., and is in the market for a 100-h.p. engine and boiler.

The Chute & Butler Co., LaFontaine, Ind., are erecting new factory buildings at Peru, the main one of which will measure 50x150 ft., 2 stories. The company will install 100-h.p. engine, 2 boilers of 100-h.p. capacity each, together with steam dry kiln, modern factory heating system and other machinery necessary for the manufacture of pianos and organs.

Chas. B. Hyde has begun the erection of new pulp plant at Niagara Falls, N. Y. New building will be of steel and wood construction, 2 stories high and will measure 40x80 ft.

The International Paper Co. will shortly begin the erection of a new pulp mill at Chatham, Me.

Diamond Match Co. will shortly begin the erection of a 5-story addition to its plant at Akron, O.

Hunter Bros., of Fulton, N. Y., are planning to erect a paper mill at Battle Island, N. Y. New plant will be of brick, cement and steel construction and will cost, it is reported, $300,000.

The John Hoberg Paper Co., Appleton, Wis., is planning an addition to its mill at Green Bay to cost $25,000, it is reported. A new boiler plant will be installed, which will necessitate the erection of a 165-ft. stack.

Reading (Pa.) Paper Mills have completed plans for the erection of a large new plant.

Badger State Shoe Co., Madison, Wis., will begin at once the erection of a large addition to their present plant, according to local newspaper reports.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

Mobile, Ala.—The following are the bids received Sept. 5 by Maj. W. E. Craighill, Corps Engrs., U. S. A., for dredging about 350,000 cu. yds. in Mobile Harbor (bidders of Mobile unless otherwise stated): Mississippi Dredging Co., 10.98 cts.; Southern Dredging Co., 13 cts.; Chas. G. Ollinger, 14 cts.; Bowers Southern Dredging Co., Galveston, Tex., 9 cts., and Geo. W. Catt, N. Y. City, N. Y., 13 cts.

Oakland, Cal.—The following are the bids opened on Sept. 5 by Col. W. H. Heuer, Corps Engrs., U. S. A., 41 Flood Bldg., San Francisco, for dredging in Oakland Harbor, 1,650,000 cu yds (price given per cu. yd.: Hawaiian Dredging Co., Honolulu, T. H., 18.5 cts; International Contract Co., Seattle, Wash., 13⅞ cts.; North American Dredging Co., San Francisco, 11.97 cts.; San Francisco Bridge Co., San Francisco, 11.87 cts.; W. A. Boole, San Francisco, 23c.; Pacific Coast Dredging & Reclamation Co., San Francisco, 19 cts.; Lord & Belser, Honolulu, T. H., 17 cts.; Marshall C. Harris, San Francisco, 10.5 cts.

**Items marked thus give the names of parties awarded contracts.*

Sacramento, Cal.—The contract for brush mattress and sinking in position in Sacramento River (bids opened Sept. 2) has been awarded to Sam Montgomery, of Davisville, Cal., at rip rap, $1.75 per ton; spawls, $1.75 per ton, and brush mattress, $1.45 per yd. Total bid, $12,365. Work requires 500 tons spawls or quarry chip; 3,500 tons rip-rap rock for bank paving and mattress sinking; 3,700 cu. yds. brush fascines for mattress.

Los Angeles, Cal.—Specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for 30,000 to 40,000 bbls. of Portland cement, bids for which will be received at the office of J. B. Lippincott, Superv. Engr., 1108 Braly Bldg., Los Angeles, as advertised in The Engineering Record.

Dover, Del.—Engineers Wilson, Miller and Reybold, of the War Dept., at Washington, D. C., are reported to be making a preliminary survey for a canal route from Dover to Philadelphia, by way of Little River. It is proposed to ask next session of Congress for appropriation to construct the canal.

Washington, D. C.—See "Power Plants, Gas and Electricity."

Washington, D. C.—Bids will be received until Oct. 25 at the Bureau of Equipment, Navy Dept., Washington (H. N. Manney, Ch.) for constructing a wharf and double cottage at the U. S. Naval Coal Depot, California City Point, Cal.

Ft. Taylor, Fla.—Bids will be received until Oct. 2 by the Quartermaster at Key West Barracks, Fla., for erecting and painting a flag staff at Ft. Taylor, as advertised in The Engineering Record.

**Miami, Fla.*—Engrs. D. D. & C. M. Rogers, of Daytona, Fla., write that the following are the bids opened on Sept. 5 for (*a*) 1,000,000 cu. yds. sand and muck in constructing a main canal about 10 miles long, per cu. yd.; (*b*) 15 miles of laterals requiring excav. of 307,000 cu. yds. sand and muck, per cu. yd.: Atlantic, Gulf & Pacific Co., Boston, Mass., *a* 17½ cts.; A. B. Bowers, San Francisco, Cal., *a* 10 cts., *b* 10 cts and 15 cts.; Bowers Southern Dredging Co., of Texas, *a* 9 cts., *b* 11 cts., and the Lake Worth Dredging & Constr. Co., of West Palm Beach, Fla. (awarded contract)) *a* 7½ cts., *b* 7½ cts. and 12 cts.

Chicago, Ill.—Bids will be received until Sept. 19, at the Treasury Dept., office of the Custodian, U. S. Marine Hospital, Chicago, for furnishing materials and completing the north boundary fence wall of the U. S. Marine Hospital reservation at this place.

Rensselaer, Ind.—Bids will be received until Sept. 29 by the Bd. Co. Comrs., for constructing the Iroquois ditch. Estimated quantities: 57,925 yds. of rock, 25,365 yds. of earth on rock, 856,000 yds. of all earth. Jas. N. Leatherman, Co. Aud.

Ottumwa, Ia.—Bids will be received until Sept. 25 by the Street Com. for furnishing material and constructing a bank protection along Des Moines River; approximate quantities 4,000 cu. yds. rock and 2,000 cu. yds. of willow after binding, as advertised in The Engineering Record.

Council Bluffs, Ia.—Specifications are on file in the office of The Engineering Record for constructing sections 1, 2, 3 and 4 of the drainage plant for Dist. No. 1 of Harrison and Pottawattamie Counties, bids for which are advertised in The Engineering Record.

Davenport, Ia.—The following are reported to be the bids received Aug. 29 for the furnishing of about 1,000 cu. yds. of rock for the building of a wall along the river: Lindwood Quarry Co., $1.59½ per cu. yd., and LeClaire Stone Co., $1.17 per cu. yd.

Centerville, Ia.—D. A. Kent, of Jewell, is reported to be Consulting Engr. in charge of the construction of a ditch 8 miles in length from the state line and running north in Chariton River Valley.

**Des Moines, Ia.*—Lew Burnett, County Aud., writes that W. F. Cook, of Des Moines, has secured the contract for constructing Saylor Township ditch, requiring 33,073 cu. yds. of earth excav. at 23.9 cts. per cu. yd.

New Orleans, La.—The U. S. Engineer opened bids Sept. 1 for levee work in Lake Borgue Levee Dist. and, according to reports, recommended that the bid of Cleary Bros. on the Bertrandville levee enlargement (in all about 15,000 cu. yds.) at 16.71 cts. per cu. yd., be accepted.

It is stated that the bids on the other levee work, namely Woodlawn levee enlargement, 43,500 cu. yds.; Fairview levee enlargement, 42,500 cu. yds., and Monsecour levee, new work and enlargement, in all 61,700 cu. yds., received and opened at the same time are too high and will probably be rejected.

New Orleans, La.—Bids will be received until Sept. 19 by Capt. J. F. McIndoe, Corps Engrs., U. S. A., for constructing about 147,200 cu. yds. of levee work in the Lake Borgne Dist.

Portland, Me.—Bids will be received until Oct. 9 by Lieut. Col. W. M. Black, Corps Engrs., U. S. A., Portland, for dredging in Cocheco River, N. H., as advertised in The Engineering Record.

Boston, Mass.—The following are the bids opened on Sept. 9 by the Bureau of Yards and Docks, Washington, D. C., for the construction of a pile and timber pier at the navy yard, Boston: Wm. L. Ellis, 17 Milk St., $47,856; Wm. J. Lawler, Charlestown (2 bids), $58,608 and $38,600 with 32 cts. per cu. yd. added for dredging; Wm. L. Miller, 19 Milk St., $59,987, and Bernard Rolf, New York, N. Y., $39,333, with 33 cts. per cu. yd. added for dredging.

Muskegon, Mich.—Bids will be received until Oct. 11 by Col. M. B. Adams, Corps Engrs., U. S. A., Grand Rapids, for construction and repair of piers at Muskegon, Mich., as advertised in The Engineering Record.

Petoskey, Mich.—Bids opened Sept. 6 by Col. M. B. Adams, Corps Engrs., U. S. A., at Grand Rapids, for constructing an extension to the west breakwater and improving harbor at Petoskey, were as follows (bidders all of Muskegon): L. G. Smith & Co., $12,947; Burk, Smith & Nelson, $13,182; Bennett & Schnorbach, $13,250; Robt. Love, $13,466, and Macdonald & Beauvais, $13,609. The detailed bid of the lowest bidder was as follows: 1,296 ft. B. M. oak timber, $57 per M.; 57,548 ft. B. M. white, Norway or southern pine or Douglas fir timber, $32.50 per M.; 143,976 ft. B. M. hemlock timber, $22,88 per M.; 21,590 lbs. drift bolts, 3¾ cts. per lb.; 650 lbs. screw bolts, 6 cts. lb.; 1,325 lbs. spikes, 4½ cts. lb.; 800 cords stone, $8.50 per cord.

Bay City, Mich.—The U. S. Engrs., it is stated, are sounding the river preparatory to the dredging of the same between Bay City and Saginaw. It is stated that about 12 shoals are to be removed or cut down, and that between 40,000 and 50,000 cu. yds. of sand are to be removed.

St. Louis, Mo.—Maj. Thos. L. Casey, Room 428, Custom House, is reported to be in charge of the engineering work to reclaim a strip of land 2 miles long, from Mississippi River on the Illinois shore, opposite St. Louis; probable cost of work, $50,000.

Billings, Mont.—Specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for furnishing 25,000 bbls. of Portland cement f. o. b. cars at works of bidder, bids to be opened Sept. 26, as advertised in The Engineering Record.

Woodbridge, N. J.—Bids will be received by Col. W. R. Livermore, Corps Engrs., U. S. A., Army Bldg., New York, N. Y., until Sept. 29, for dredging in Woodbridge Creek, as advertised in The Engineering Record.

New York, N. Y.—The following bids were received Sept. 7 by Col. W. R. Livermore, Corps Engrs., U. S. A., for dredging and rock removal in East River and Hell Gate, N. Y., price given per cu. yd.: (*a*) Middle Reef, prism measurement; (*b*) Sheel Reef, prism measurement, and (*c*) Battery Reef and South Ferry Reef, W. H. Beard Dredging Co., *a* $8.90, *b* $2.20 and *c* $1.95; R. G. Packard Co., *a* $18.50, *b* $1.46 and c $1.65; Morris & Cumings Dredging Co., *b* and *c* $1.90.

*Bids were opened Sept. 1 by the Dept. of Docks and Ferries (Maurice Featherson, Comr.) for (*a*) 3,000 cu. yds. sand, and (*b*) 7,500 cu. yds. broken stone (bidders all Boro. Manhattan): Murray & Co., 263 Ave. C., *a* 75 cts. (awarded contract), *b* $1.10; Brown & Fleming Contr. Co., 129 Broad St., *b* 94 cts. (awarded contract); Manhattan Trap Rock Co., *b* $1.07, and Jacob E. Conklin, *b* scow measurement (bidders all of New York City): The International Contr. Co., *a* $30, *b* $2.85, and *c* 98 cts.; $1.12.

*Bids were opened same time and place for furnishing and putting in place (*a*) 15,000 cu. yds. small cobblestone, and (*b*) about 20,000 cu. yds. rip rap stone (bidders all of Boro. Manhattan): O'Brien Bros., *a* 48 cts.; Brown & Fleming Contr. Co., *a* 48 cts., and *b* 47 cts., and Bouker Contr. Co., 21 State St., *b* 43 cts. (awarded contract).

The following are the bids opened on Sept. 9 and 12 by Col. W. R. Livermore, Corps Engrs., U. S. A., Room F 7, Army Bldg., for dredging: *a* Harlem River, amount to be dredged at price of lowest bid, 116,279 cu. yds.; *b* Browns Creek, 12,500 cu. yds.; *c* Bronx River, 14,492 cu. yds.; *d* Hudson River, 280,000 cu. yds.; *e* Rondout Harbor, 27,778 cu. yds.; International Contr. Co., N. Y. City, *a* 44.8 cts., *d* 35 cts.; Wm. H. Beard Dredging Co., 21 State St., *a* 39 cts.; R. G. Packard Co., 130 Pearl St., *a* 42 cts.; Seely-Taylor Co., 78 Broad St., *a* 25.8 cts.; Morris & Cumings Dredging Co., 17 State St., *a* 37.5 cts.; *d* 34.5 cts.; Lock & Field, Islip, *b* 20 cts.; John & Jos. McSpirit, 118 Wayne St., Jersey City, N. J., *c* 69 cts.; Ambrose C. Driscoll, Syracuse, *d* 26 cts.; *e* 24 cts.; Newburgh Dredging Co., Newburgh, *d* 22.5 cts.; John P. Randerson, 755 Madison Ave., Albany, *e* 18 cts.

Rockaway Beach, L. I., N. Y.—It is said to be the intention of the officials of the city Fire Dept. to install an independent telegraphic alarm system in the 5th Ward, the cost of the installation alone, it is stated, will be about $12,000.

Gowanda, N. Y.—Bids will be received until Sept. 27 by the State Comn. in Lunacy, at the Capitol, Albany, for constructing a conduit from the power house to present buildings at the Gowanda State Homeopathic Hospital, as advertised in The Engineering Record.

Long Island City, L. I., N. Y.—Bids will be received until Sept. 25 by Nicholas J. Hayes, Fire Comr., New York City, for furnishing and delivering 50 fire alarm telegraph signal boxes for the Boro. Queens.

Greenville, O.—Bids will be received until Sept. 29 by the Bd. Co. Comrs., for $35,000 ditch improvement bonds. E. Culbertson, Co. Aud.

Panama.—The following are the bids opened on Sept. 12 by the Isthmian Canal Comn. at Washington, D. C., for 20,000 bbls. Portland cement: Alfred Hillyer, of New Orleans, La., bid $2.47 per bbl. if delivered 500 bbl. lots, if in 5,000 bbl. lots will deduct 10 cts. on bbl., and if 20,000 bbls. are wanted at once will deduct 20 cts. on bbl. The other bidders were: J. K. Joyce, Chicago, Ill., $2.37 per bbl.; Commercial Cement Co., New York, N. Y., $2.39; Alpha Cement Co., Easton, Pa., $2.35; Bladenberg, Thallman Co., New York, N. Y., $2.06; F. S. Banks Co., New York, N. Y., (Saturn), $1.98.99; Linchan & Moler, Dubuque, Ia., $2.06. All the above to be delivered at Colon, and the Noulhan Cement Co., of London, England, put in a bid through Carr Bros., of New York, N. Y., at $1.95 per bbl. at London, England, and $2.49 per bbl. to be delivered at La Boca.

Nashville, Tenn.—The following bids were opened Aug. 31 by Maj. H. C. Newcomer, Corps. Engrs., U. S. A., for building concrete Lock and Dam No. 21, Cumberland River. (*a*) Ohio River Contract Co., Parkersburg, W. Va., (*b*) Continental Engineering & Contr. Co., Buffalo, N. Y., and (*c*) J. G. White & Co., New York, N. Y.

Locks, abutments, etc.	*a*	*b*	*c*
31,850 cu. yds. earth excav.	$.50	$.48	$.50
935 cu. yds. rock excav.	2.00	2.00	2.60
26,570 cu. yds. embkt.	.33	.44	.33
18,732 cu. yds. concrete	†7.25 ‡7.50	†5.22 ‡5.45	.. ‡8.50
13,506 cu. yds. riprap hand plcd.	4.50	2.35	3.25
650 cu. yds. paving	6.00	2.65	4.50
8,500 cu. yds. stone filling	2.50	1.94	1.95
800 cu. yds. puddling	2.50	1.50	1.30
1,440 ft. B. M. oak timber per M	90.00	65.00	92.00
7,550 ft. B. M. pine timb. per M.	60,00	60.00	65.00
50 lin. ft. bolt holes	1.00	.50	.39
Total	†250,930 ‡255,613	†178,353 ‡182,661	.. ‡251,423

Dam—	*a*	*b*	*c*
370 cu. yds. earth excav.	.50	1.10	1.20
50 cu. yds. rock excav.	2.00	3.50	2.60
4,351 cu. yds. concrete	†7.50 ‡7.50	†7.22 ‡7.45	.. ‡9.75
Total	†31,830 ‡32,917	†31,996 ‡32,997	.. ‡42,996
Grand total	†282,759 ‡288,530	†210,349 ‡215,658	.. ‡294,419

† Cement in sacks.
‡ Cement in bbls.

Newport, R. I.—See "Public Buildings."

Philadelphia, Pa.—The Common Council on Sept. 7, it is stated, passed a loan bill for $375,000 for the deepening of the Delaware River channel.

Bids will be received until Oct. 23 by Capt. C. A. F. Flagler, Corps. Engrs., U. S. A., for constructing a rehandling machine for dredged material, as advertised in The Engineering Record.

Ft. Douglas, Utah.—Bids will be received until Sept. 30 by Col. C. A. H. McCauley, Ch. Q. M., U. S. A., Denver, Col., for furnishing material and constructing about 9 miles barbed wire fence around original military reservation and about 16 miles of barbed wire fence around the water reserve portion of military reservation at Ft. Douglas.

Milwaukee, Wis.—It is stated that City Engineer Chas. J. Poetsch is not in favor of improving the Milwaukee River at a cost of about $250,000, but believes that the Kinnickinnic and Menominee River channels should be developed in preference.

Lewiston, Wis.—Bids will be received until Sept. 19 by the State Levee Com., Portage (W. C. Gault, Secy.) for repairing about 4 miles of levee in the town of Lewiston, total estimated amount of dirt to be removed, 29,640 cu. yds.

Guantanamo, Cuba.—Bids will be received until Oct. 10 by Capt. E. H. Schulz, Corps Engrs., U. S. A., Army Bldg., N. Y. City, N. Y., for furnishing 6,500 bbls. Portland cement, on wharf at Conde Beach, Guantanamo Bay, Cuba (depth of water at low tide 18 ft.), or f. o. b. Prentice Stores, Brooklyn, N. Y., as advertised in The Engineering Record.

The following are the bids opened Sept. 9 by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for a self-propelling derrick of 250 tons capacity for the naval station, Guantanamo: (*a*) for work complete; (*b*) amount to be deducted if propellers, 2 propelling engines, rudder, tiller and pilot house are omitted: Roderman Bros., *a* $13,650, *b* $2,000; The Snare & Triest Co., New York, N. Y., *a* $20,700, *b* $4,000; Wm. L. Miller, Boston, Mass., *a* $19,690, *b* $4,100.

PROPOSALS OPEN

For Proposals see pages 54, 56, 57, 58, 60, 61 & 64

WATER WORKS.

Bids Close.		See Eng. Record.
Sep. 18.	Intake, Albany, N. Y.	Sep. 9
Sep. 19.	Pumps, etc., Toronto, Ont. Adv. Aug. 5 to 19.	Aug. 5
Sep. 19.	Pump, engine, Burlington, N. J Adv. Aug. 26 to Sep. 16.	Aug. 26
Sep. 20.	Reservoir, Garfield, N. J. Adv. Sep. 16.	Sep. 16
Sep. 21.	Pump, sta., Galveston, Tex. Adv. Aug. 26 to Sep. 2.	Aug. 26
Sep. 21.	Gallery, Columbus, Ind.	Sep. 16
Sep. 25.	C. I. pipe, etc., Reading, O.	Sep. 16
Sep. 25.	Water wks., Glendive, Mont.	Aug. 26
Sep. 25.	Water Wks., Lanesville, Wis.	Sep. 16
Sep. 25.	Dam, pipe line, etc., Danbury, Conn. Adv. Sep. 16.	Sep. 16
Sep. 25.	Water Wks., Cranbury, N. J. Adv. Sep. 9, 16.	Sep. 9
Sep. 26.	Tunnel, Montrose, Colo. Adv. Aug. 12 to Sep. 16.	Aug. 12
Sep. 26.	System, Boyd, Minn.	Sep. 16
Sep. 28.	Tank, Vancouver Barracks, Wash. Adv. Aug. 26 to Sep. 9.	Aug. 26
Sep. 28.	Water Wks., material, Floresville, Tex. Adv. Sep. 16.	Sep. 16
Sep. 29.	Filters, etc., Cincinnati, O. Adv. Sep. 2 to Sep. 16.	Sep. 2
Sep. 29.	Boiler, wells, etc., Ft. Screven, Ga. Adv. Sep. 2 to Sep. 16.	Sep. 2
Sep. 30.	Pipe laying, Perth Amboy, N. J.	Aug. 26
Sep. 30.	C.-i. pipe, Chicago, Ill.	Sep. 16
Sep. 30.	System, Newark, O. Adv. Sep. 16.	Sep. 16
Sep. —	Water Wks., E. Grand Forks, Minn.	Aug. 19
Sep. —	Water works, Jackson, Mo.	Aug. 19
Sep. —	Reservoir, McLeansboro, Ill.	Aug. 26
Oct. 2.	Boiler, Homestead, Pa.	Sep. 16
Oct. 3.	System, Shoshone Agency, Wyo.	Sep. 9
Oct. 4.	Boilers, Chicago, Ill.	Sep. 16
Oct. 10.	Basins, etc., Toledo, O. Adv. Sep. 16.	Sep. 16
Oct. 11.	Pipe and specials, Portland, Ore. Adv. Sep. 16.	Sep. 16
Oct. 11.	Water mains, Portland, Ore. Adv. Sep. 16.	Sep. 16
Oct. 12.	Sale of standpipe, Attleboro. Mass. Adv. Jul. 29 to Aug. 5.	Jul. 29
Oct. 13.	Valves, etc., Cincinnati, O.	Sep. 16
Oct. 16.	System, Rolla, Mo. Adv. Sep. 16.	Sep. 16
Oct. 17.	Embankment, Roswell, N. M. Adv. Aug. 26 to Sep. 16.	Aug. 26
Oct. 18.	Water Wks., Milledgeville, Ga. Adv. Sep. 9 to Sep. 16.	Sep. 9
Oct. 18.	Mains, Boulder, Colo. Adv. Sep. 16.	Sep. 16
Oct. 24.	System, Ciudad Juarez, Mex.	Sep. 16
Oct. 26.	Dams, canals, etc., Belle Fourche, S. D. Adv. Sep. 2 to Sep. 16.	Sep. 2
Dec. 5.	Dam, Glendive, Mont. Adv. Sep. 16.	Sep. 16

SEWERAGE AND SEWAGE DISPOSAL.

Sep. 19.	Southern Pines, N. C.	Aug. 19
Sep. 19.	New York, N. Y.	Sep. 9
Sep. 19.	Toronto, Ont.	Sep. 16
Sep. 19.	Bellevue, Pa.	Sep. 16
Sep. 19.	Davenport, Ia.	Sep. 16
Sep. 20.	Salem, O.	Sep. 2
Sep. 20.	Brooklyn, N. Y.	Sep. 16
Sep. 20.	Marion, O.	Sep. 16
Sep. 21.	Cincinnati, O.	Sep. 2
Sep. 21.	St. Paul, Minn.	Sep. 16
Sep. 22.	Cincinnati, O.	Sep. 2
Sep. 23.	Chicago, Ill. Adv. Sep. 9 to Sep 16.	Sep. 9
Sep. 25.	Glendive, Mont.	Aug. 26
Sep. 25.	Washington, D. C. Adv. Sep. 16.	Sep. 16
Sep. 25.	Indianapolis, Ind.	Sep. 16
Sep. 25.	Ames, Ia.	Sep. 16
Sep. 26.	Wenatchee, Wash.	Sep. 9
Sep. 26.	Virginia, Minn.	Sep. 9

**Items marked thus give the names of parties awarded contracts.*

Sep. 26.	Dayton, O. Adv. Sep. 16.	Sep. 16
Sep. 27.	Haddonfield, N. J. Adv. Sep. 2 to Sep. 9.	Sep. 2
Sep. 27.	Brooklyn, N. Y.	Sep. 16
Sep. 29.	Crete, Ind.	Sep. 16
Sep. 30.	Benson, Minn.	Sep. 16
Sep. 30.	Boston, Mass.	Sep. 16
Oct. 2.	Cresco, Ia.	Sep. 16
Oct. 3.	Shoshone Agency, Wyo.	Sep. 9
Oct. 3.	North Platte, Neb. Adv. Sep. 16.	Sep. 16
Oct. 4.	Gravity outlet sewer, Salt Lake City, Utah. Adv. Sep. 16.	Sep. 16
Oct. 4.	**Intercepting sewer and pump, etc., Salt Lake City, Utah. Adv. Sep. 16.**	Sep. 16
Oct. 10.	Norristown, Pa. Adv. Sep. 9 to Sep. 16.	Sep. 9
Oct. 16.	Cape Girardeau, Mo. Adv. Sep. 16.	Sep. 16

BRIDGES.

Sep. 19.	Hartford, Conn. Adv. Sep. 2 to Sep. 9.	Sep. 2
Sep. 19.	Upper Sandusky, O.	Sep. 2
Sep. 20.	Portage, Wis.	Sep. 16
Sep. 20.	Cincinnati, O.	Sep. 16
Sep. 21.	Independence, Mo.	Sep. 16
Sep. 23.	Cleveland, O.	Sep. 9
Sep. 23.	Belle River, Minn.	Sep. 16
Sep. 23.	Pinkerton, Ont.	Sep. 16
Sep. 23.	Bluffton, Ind.	Sep. 16
Sep. 25.	Washington, D. C. Adv. Sep. 2 to Sep. 16.	Sep. 2
Sep. 26.	Mankato, Minn.	Sep. 9
Sep. 29.	Springfield, O.	Sep. 9
Sep. 30.	San Juan, Porto Rico (2 prop.) Adv. Aug. 26 to Sep. 9.	Aug. 26
Oct. 1.	Pensacola, Fla.	Aug. 12
Oct. 1.	Jefferson City, Mo	Sep. 16
Oct. 2.	Port Orchard, Wash.	Sep. 2
Oct. 2.	Peoria, Ill.	Sep. 9
Oct. 3.	Bermuda, La.	Sep. 2
Oct. 4.	**Superstructure, Chicago, Ill.**	Aug. 12
Oct. 4.	**Substructure, Chicago, Ill**	Aug. 12
Oct. 10.	Columbus, O.	Sep. 16
———	Minnesota City, Minn.	Sep. 9

PAVING AND ROADMAKING.

Sep. 19.	Wilmington, Del.	Sep. 9
Sep. 19.	New York, N. Y.	Sep. 9
Sep. 19.	Toronto, Ont.	Sep. 16
Sep. 19.	Bellevue, Pa.	Sep. 16
Sep. 19.	Rockville, Md.	Sep. 16
Sep. 19.	Sterling, Ill.	Sep. 16
Sep. 20.	Freeport, Ill. Adv. Sep. 9 to Sep. 16.	Sep. 9
Sep. 20.	Oakmont, Pa.	Sep. 16
Sep. 20.	Yeadon, Pa.	Sep. 16
Sep. 20.	Ft. Sheridan, Ill.	Sep. 16
Sep. 21.	Buffalo, N. Y.	Sep. 16
Sep. 22.	Madisonville, O.	Sep. 2
Sep. 22.	New York, N. Y.	Sep. 16
Sep. 22.	Iowa City, Ia.	Sep. 16
Sep. 22.	Indianpolis, Ind.	Sep. 16
Sep. 22.	Champaign, Ill.	Sep. 16
Sep. 23.	Little Rock, Ark.	Sep. 2
Sep. 25.	Indianapolis, Ind.	Sep. 16
Sep. 25.	Concord, N. H.	Sep. 16
Sep. 25.	Niles, Mich.	Sep. 16
Sep. 25.	Houston, Tex.	Sep. 16
Sep. 26.	Cleveland Heights, O.	Sep. 9
Sep. 26.	Rye, N. H. Adv. Sep. 16	Sep. 16
Sep. 27.	Cincinnati, O.	Sep. 9
Sep. 28.	Roanoke, Va.	Sep. 16
Sep. 30.	Cleveland, O.	Sep. 16
Sep. —.	Macon, Mo.	Sep. 2
Oct. 2.	Johnstown, N. Y. Adv. Sep. 16.	Sep. 16
Oct. 2.	Macon, Mo.	Sep. 16
Oct. 2.	Sykesville, Md.	Sep. 16
Oct. 3.	Paterson, N. Y.	Sep. 16
Oct. 3.	Columbus, Ga. Adv. Sep. 16	Sep. 16
Nov. 1.	Steelton, Pa. Adv. Sep. 2 to 16.	Sep. 16

POWER, GAS AND ELECTRICITY.

Sep. 19.	Toledo, O.	Sep. 9
Sep. 19.	Washingon, D. C.	Sep. 9
Sep. 21.	Chicago, Ill.	Sep. 16
Sep. 25.	New Brighton, S. I., N. Y.	Sep. 16
Sep. 25.	Knoxville, Tenn.	Sep. 16
Sep. 25.	Syracuse, N. Y.	Sep. 16
Sep. 26.	Washington, D. C.	Sep. 16
Sep. 27.	Baltimore, Md Adv. Sep. 2 to 9.	Sep. 2
Sep. 27.	Utica, N. Y. Adv. Sep. 16.	Sep. 16
Sep. 30.	Washington, D. C. Adv. Aug. 5.	Aug. 5
Oct. 1.	**Tacoma, Wash.**	**Jul. 8**
Oct. 1.	Troy, Ala.	Sep. 9
Oct. 3.	Syracuse, N. Y.	Sep. 16
Oct. 4.	Jacksonville, Fla.	Sep. 2
Oct. 4.	Syracuse, N. Y.	Sep. 16
Oct. 4.	Ft. Leavenworth, Kan.	Sep. 16
Oct. 11.	Lockport, Ill.	Aug. 19
Oct. 15.	Reading, O.	Aug. 26
Nov. 1.	Chicago. Ill.	Sep. 9
Nov. 1.	Roosevelt, Ariz.	Sep. 16
Dec. 2.	San Juan, Porto Rico	Aug. 19

BUILDINGS.

Sep. 18.	Pub. bldg., Duluth, Minn Adv. Aug. 26 to Sep. 16.	Aug. 26
Sep. 18.	Pub. Bldg., Erie, Pa	Aug. 26
Sep. 18.	Pub. Bldg., Winona, Minn	Sep. 9
Sep. 18.	Add. to Hosp., San Jose, Cal	Sep. 9
Sep. 18.	Bus. bldg., St. Louis, Mo	Sep. 9
Sep. 19.	Capitol, Bismarck, N. D.	Aug. 19
Sep. 19.	Bldg. material, Crowcreek, S. D.	Sep. 2
Sep. 19.	School, Glendive, Mont	Sep. 9
Sep. 19.	**Pub. bldg., Newport, R. I**	**Sep. 16**
Sep. 19.	Library, Williamsport, Pa.	Sept. 16
Sep. 20.	Court House, Akron, O.	Aug. 19
Sep. 20.	Schools, Jocko, Mont.	Sep. 2
Sep. 20.	Furnace, P. O., Washington, D. C.	Sep. 2
Sep. 20.	Church, Beaumont, Tex.	Sep. 9
Sep. 20.	Pub. Bldg., Indianapolis, Ind	Sep. 16
Sep. 20.	Bus. Bldg., Batesville, Ark	Sep. 16
Sep. 20.	Warehouse, Philadelphia, Pa.	Sep. 16
Sep. 20.	School, Fargo, N. D.	Sep. 16
Sep. 20.	Church, St. Louis, Mo.	Sep. 16
Sep. 21.	Pub. Bldg., New York, N. Y	Sep. 16
Sep. 21.	Hotel, St. Louis, Mo.	Sep. 16
Sep. 22.	School, Oneida, Wis.	Aug. 26
Sep. 22.	Storehouse, Ft. Hancock, N. J. Adv. Sep. 9 to Sep. 16.	Sep. 9
Sep. 22.	Htg. Pub. Bldgs., New York, N. Y.	Sept. 16
Sep. 23.	School, Oniro, Wis.	Sep. 9
Sep. 24.	Freight house, Dayton, O.	Sep. 2
Sep. 25.	Htg., pub bldg., New York, N. Y.	Sep. 16
Sep. 25.	Hotel Monmouth, Ill.	Sep. 16
Sep. 25.	**Schools, New York, N. Y.**	Sep. 16
Sep. 27.	Bldg. material, Poplar, Mont.	Sep. 9
Sep. 27.	Pub. bldg., Middletown, N. Y. Adv. Sep. 9 to Sep. 16.	Sep. 9
Sep. 27.	Pub. Bldg., Mitchell, S. D.	Sep. 16
Sep. 28.	School, Washington, D. C.	Sep. 2
Sep. 28.	Boiler, etc., Pub. Bldgs., Baltimore, Md.	Sep. 2
Sep. 29.	Post Bldgs., Ft. De Soto, Fla	Sep. 9
Sep. 30.	**Htg., etc., pub. bldg., Washington, D. C. Adv. Aug. 5 to Sep. 16.**	Aug. 5
Sep. 30.	Mess hall, etc., Washington, D. C. Adv. Sep. 2 to Sep. 16.	Sep. 2
Sep. 30.	Pub. Bldg. New York N. Y.	Sep. 2
Oct. 1.	Hospital, Memphis, Tenn.	Aug. 26
Oct. 1.	Fire headquarters, Kansas City, Mo.	Sep. 2
Oct. 2.	Repairing court house, Rosedale, Miss.	Aug. 26
Oct. 2.	Htg. jail, Cleveland, Miss	Aug. 26
Oct. 2.	School, Pottawatomie, Kan.	Sep. 16
Oct. 4.	Pub. Bldgs., Ft. Wayne, Detroit, Mich. Adv. Sep. 9 to Sep. 16.	Sep. 9
Oct. 4.	Post bldg., Ft. Riley, Kan Adv. Sep. 9 to Sep. 16.	Sep. 9
Oct. 5.	Courthouse, Manhattan, Kan.	Aug. 12
Oct. 5.	School, Browning, Mont.	Sep. 16
Oct. 12.	P. O. extension, Fargo, N. D.	Sep. 9
Oct. 16.	Court house, Gretna, La.	Sep. 2
Oct. 16.	School, San Francisco, Cal.	Sep. 16
Oct. 18.	Post Bldgs., Vancouver Barracks, Wash. Adv. Sep. 16.	Sept. 16
Oct. 25.	Pub. Bldgs., Washington, D. C.	Sep. 16
Nov. 1.	Pub. bldg. plans, Salem, Mass	Sep. 16
Nov. 15.	School, Cleveland, O.	Sep. 16
Dec. 1.	Dwelling, Wilmington, N. C.	Sep. 16
Jan. 15.	'06 Church, Riverside, Ia.	Sep. 16
———	School, Santa Fe., N. M.	Sep. 2
———	School, Lawrence, Kan.	Sep. 2
———	Church, Ft. Worth, Tex.	Sep. 2
———	School, Mt. Pleasant, Mich.	Sep. 16
———	School, Flandreau, S. D.	Sep. 16
———	School, Breen, Colo.	Sep. 16

MISCELLANEOUS.

Sep. 18.	Sweeping machine, Sherman, Tex. Adv. Sept. 2.	Sep. 2
Sep. 18.	El. Ry. Woodland Cal.	Sep. 2
Sep. 18.	Retain. wall, Indianapolis, Ind.	Sep. 9
Sep. 18.	St. cleaning, Philadelphia, Pa.	Sep. 16
Sep. 19.	Supplies, Washington, D. C.	Aug. 26
Sep. 19.	Ditch work, Council Bluffs, Ia. Adv. Sep. 2 to Sep. 16.	Sep. 2
Sep. 19.	Supplies, Washington, D. C.	Sep. 9
Sep. 19.	Wall, Chicago, Ill.	Sep. 16
Sep. 19.	Levee work, New Orleans, La.	Sep. 16
Sep. 19.	Levee work, Lewiston, Wis.	Sep. 16
Sep. 19.	Conduit, Newport, R. I.	Sep. 16
Sep. 20.	Pier improv., Charlevoix, Mich. Adv. Aug. 26 to Sep. 16.	Aug. 26
Sep. 20.	Rock excav., Pawtucket, R. I. Adv. Sep. 2 to Sep. 16.	Sep. 2
Sep. 20.	Park work Baltimore Md.	Sep. 2
Sep. 22.	Dam improv., Wheeling, W. Va.	Aug. 26
Sep. 20.	El. Ry. borings, New York, N. Y. Adv. Sep. 9 to Sep. 16.	Sep. 9
Sep. 22.	Supplies, Panama	Sep. 2
Sep. 23.	Ditch, Des Moines Ia.	Sep. 2
Sep. 23.	Dredging, Philadelphia, Pa.	Sep. 9
Sep. 25.	Bank protection, Ottumwa, Ia. Adv. Sep. 16.	Sep. 16
Sep. 25.	Signal boxes, Long Island City, L. I., N. Y.	Sep. 16
Sep. 26.	Telephone, Washington, D. C.	Sep. 2
Sep. 26.	Cement, Billings, Mont. Adv. Sep. 2 to 16.	Sep. 2
Sep. 26.	Elevators, Baltimore, Md. Adv. Sep. 2 to 9.	Sep. 2
Sep. 26.	Ditch, Van Wert, O.	Sep. 9
Sep. 26.	Supplies, Washington, D. C.	Sep. 16
Sep. 27.	Telephone system, Kearny, N. J. Adv. Sep. 9.	Sep. 9
Sep. 27.	Conduit, Gowanda, N. Y. Adv. Sep. 16.	Sep. 16
Sep. 29.	Dredging, Woodbridge, N. J Adv. Sep. 16.	Sep. 16
Sep. 29.	Ditch, Rensselaer, Ind.	Sep. 16
Sep. 30.	**Crane track, Boston, Mass.**	Sep. 2
Sep. 30	Dredging, Los Angles, Cal. Adv. Sep. 9 to Sep. 16.	Sep. 9
Sep. 30.	Fence, Ft. Douglas, Utah	Sep. 16
Oct. 2.	Flag staff, Ft. Taylor, Fla. Adv. Sep. 16.	Sep. 16
Oct. 3.	Supplies, San Francisco, Cal	Aug. 26
Oct. 3.	Dredging, Norfolk, Va.	Sep. 9
Oct. 3.	Supplies, Washington, D. C.	Sep. 9
Oct. 4.	Piers exten., Holland, Mich. Adv. Sep. 9 to Sep. 16.	Sep. 9
Oct. 6.	Elevator, Cincinnati, O.	Sep. 9
Oct. 9.	Dredging, Portland, Me. Adv. Sep. 16.	Sep. 16
Oct. 10.	Supplies, Washington, D. C.	Sep. 9
Oct. 10.	Cement, Guantanamo, Cuba. Adv. Sep. 16.	Sep. 16
Oct. 10.	Garb disp., Bridgeport, Conn	Sep. 16
Oct. 11.	Pier, Muskegon, Mich. Adv. Sep. 16.	Sep. 16
Oct. 23.	Dredging Machine, Philadelphia, Pa. Adv. Sep. 16.	Sep. 16
Oct. 25.	Dock, Chicago, Ill.	Sep. 2
Oct. 25.	Wharf, Washington, D. C.	Sep. 16
Nov. 1.	Garbage franchise, New Orleans, La.	Sep. 16
Nov. 6.	Garb. disp., New York, N. Y. Adv. Sep. 9 to Sep. 16.	Sep. 2
Nov. 9.	**Wharf, etc., Havana, Cuba**	**Jul. 29**
Dec. 15.	R. R., Manila, P. I.	Sep. 16
Jan. 1.	**Statue plans, Indianapolis, Ind**	**Jul. 22**
Apr. 2,	**'06. Harbor Work, Valparaiso, Chili,** Adv. Apr. 29 to Sep. 9.	**Apr. 29**
———	R. R. work, Providence, Ky.	Aug. 26
———	Excav., Indianapolis, Ind.	Aug. 26

PROPOSALS.

Proposals for Cast Iron Water Pipe and Special Castings.

Sealed proposals will be received by the Water Board of the City of Portland, Oregon, until 3 P. M., October 11, 1905, for furnishing and delivering at Portland, Ore., the following approximate quantities of cast-iron water pipe and special castings, viz.: 450 lengths 20-inch cast-iron pipe—weight per length, 1,920 lbs. = 432 tons; 210 lengths 16-inch cast-iron pipe—weight per length, 1,390 lbs. = 146 tons; total weight of pipes, 578 tons.

Special castings for cast-iron water pipe = 26,000 lbs.

Specifications and form of proposal can be obtained at the office of D. D. Clarke, Engineer of the Water Board, City Hall, Portland, Oregon.

Bidders must state the price of pipe per ton of 2,000 pounds and the price of special castings per pound, all delivered f. o. b. cars Portland, Oregon, delivery of same to be completed on or before December 20, 1905.

With each bid must be deposited a certified check for $1,000.00, payable to the order of the Auditor of the City of Portland, Oregon, and bonds to be approved by the Mayor will be required of the successful bidder.

The right is reserved by the Water Board to reject any or all bids.

Proposals must be enclosed in an envelope, endorsed on the outside: "Proposals for Water Pipe and Special Castings," and addressed to the undersigned.

As additional pipe materials may be required for use early in the season of 1906, the Water Board wishes the option of ordering not later than November 8, 1905, all or part of the following pipes and specials.

Bidders are therefore requested to state whether they will give such option and, if so, quote prices for delivery f. o. b. cars Portland, Oregon; delivery of same to begin within sixty days of date of order and to continue at the rate of 700 tons per month until completion.

230 lengths 24-in. cast-iron pipe—weight 2,290 lbs. per length = 264 tons.

970 lengths 24-in. cast-iron pipe—weight 2,550 lbs. per length = 1,237 tons.

335 lengths 24-in. cast-iron pipe—weight 2,780 lbs. per length = 466 tons.

1,100 lengths 24-in. cast-iron pipe—weight 3,000 lbs. per length = 1,650 tons.

Total, 3,617 tons.

Special castings for 24-in. water mains = 140,000 pounds.

By order of the Water Board,
FRANK T. DODGE,
Superintendent.
Portland, Oregon, September 1, 1905.

Water Works Reinforced Concrete Reservoir.

Sealed proposals will be received by the Borough of Garfield, N. J., at 8:00 P. M., Wednesday, Sept. 20 next, for constructing a reinforced concrete reservoir.

Plans and specifications may be seen, and blank forms of proposal may be obtained of Leonard A. Troast, Chm. of Committee, at 37 Washington Place, Garfield, N. J., or at the office of Wise & Watson, Engineers, 34 Bloomfield Ave., Passaic, N. J.

The bids of Contractors only who have had experience in this character of work will be finally considered. A certified check for $500.00 must accompany each bid.

The right to reject any or all bids is reserved.
WM. B. HEPWORTH,
Mayor.
Leonard A. Troast,
Chm. Committee.
Cornelius Warnaar,
Robert Dietrich,
WISE & WATSON, Engineers.

Additional Proposal Advertisements are printed on pages 56, 57, 58, 60, 61 and 64